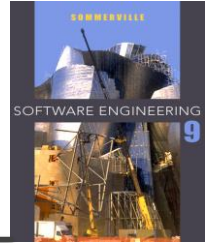


Lec 08 - Architectural Design

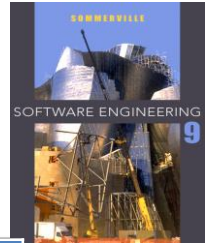
Part 2

Repository architecture



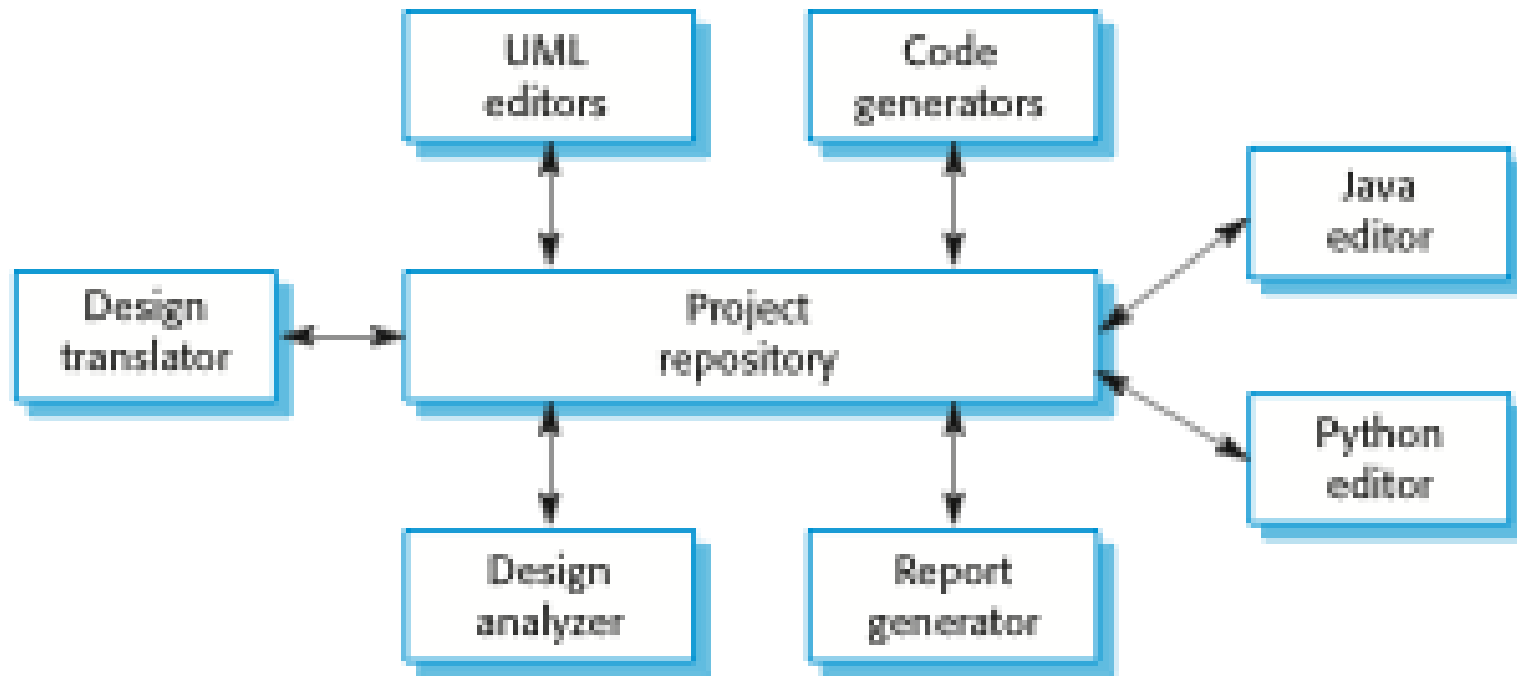
- ✧ Sub-systems must exchange data. This may be done in two ways:
 - Shared data is held in a central database or repository and may be accessed by all sub-systems;
 - Each sub-system maintains its own database and passes data explicitly to other sub-systems.
- ✧ When large amounts of data are to be shared, the repository model of sharing is most commonly used as this is an efficient data sharing mechanism.

The Repository pattern



Name	Repository
Description	All data in a system is managed in a central repository that is accessible to all system components. Components do not interact directly, only through the repository.
Example	Figure 6.9 is an example of an IDE where the components use a repository of system design information. Each software tool generates information which is then available for use by other tools.
When used	You should use this pattern when you have a system in which large volumes of information are generated that has to be stored for a long time. You may also use it in data-driven systems where the inclusion of data in the repository triggers an action or tool.
Advantages	Components can be independent—they do not need to know of the existence of other components. Changes made by one component can be propagated to all components. All data can be managed consistently (e.g., backups done at the same time) as it is all in one place.
Disadvantages	The repository is a single point of failure so problems in the repository affect the whole system. May be inefficiencies in organizing all communication through the repository. Distributing the repository across several computers may be difficult.

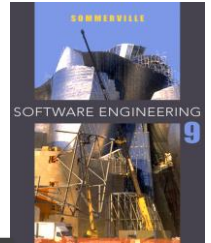
A repository architecture for an IDE



Client-server architecture

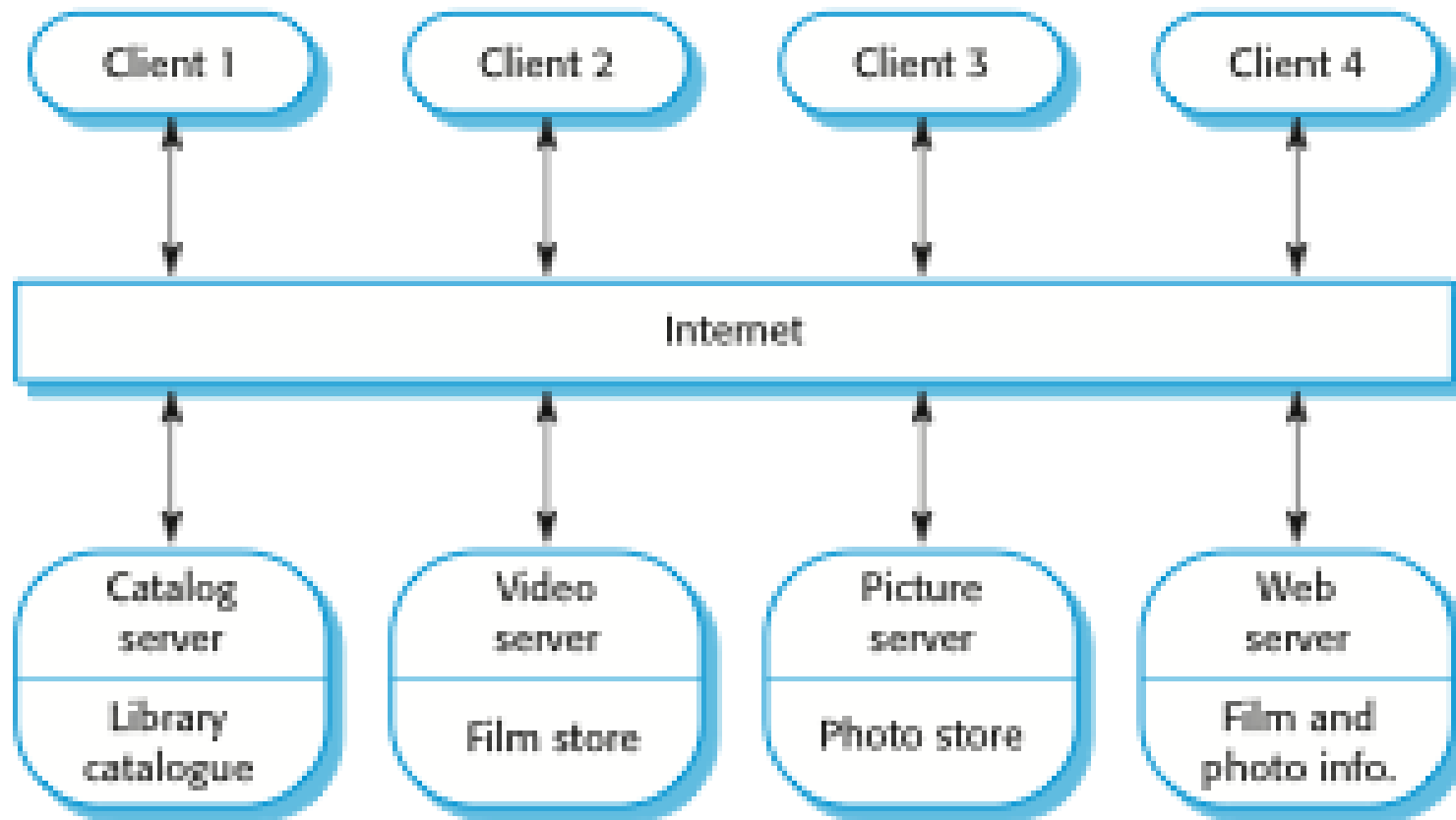
- ✧ Distributed system model which shows how data and processing is distributed across a range of components.
 - Can be implemented on a single computer.
- ✧ Set of stand-alone servers which provide specific services such as printing, data management, etc.
- ✧ Set of clients which call on these services.
- ✧ Network which allows clients to access servers.

The Client–server pattern

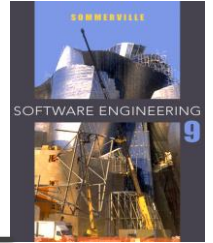


Name	Client-server
Description	In a client–server architecture, the functionality of the system is organized into services, with each service delivered from a separate server. Clients are users of these services and access servers to make use of them.
Example	Figure 6.11 is an example of a film and video/DVD library organized as a client–server system.
When used	Used when data in a shared database has to be accessed from a range of locations. Because servers can be replicated, may also be used when the load on a system is variable.
Advantages	The principal advantage of this model is that servers can be distributed across a network. General functionality (e.g., a printing service) can be available to all clients and does not need to be implemented by all services.
Disadvantages	Each service is a single point of failure so susceptible to denial of service attacks or server failure. Performance may be unpredictable because it depends on the network as well as the system. May be management problems if servers are owned by different organizations.

A client-server architecture for a film library



Application architectures



- ✧ Application systems are designed to meet an organizational need.
- ✧ As businesses have much in common, their application systems also tend to have a common architecture that reflects the application requirements.
- ✧ A generic application architecture is an architecture for a type of software system that may be configured and adapted to create a system that meets specific requirements.

Use of application architectures

- ✧ As a starting point for architectural design.
- ✧ As a design checklist.
- ✧ As a way of organising the work of the development team.
- ✧ As a means of assessing components for reuse.
- ✧ As a vocabulary for talking about application types.

Examples of application types

✧ Data processing applications

- Data driven applications that process data in batches without explicit user intervention during the processing.

✧ Transaction processing applications

- Data-centred applications that process user requests and update information in a system database.

✧ Event processing systems

- Applications where system actions depend on interpreting events from the system's environment.

✧ Language processing systems

- Applications where the users' intentions are specified in a formal language that is processed and interpreted by the system.

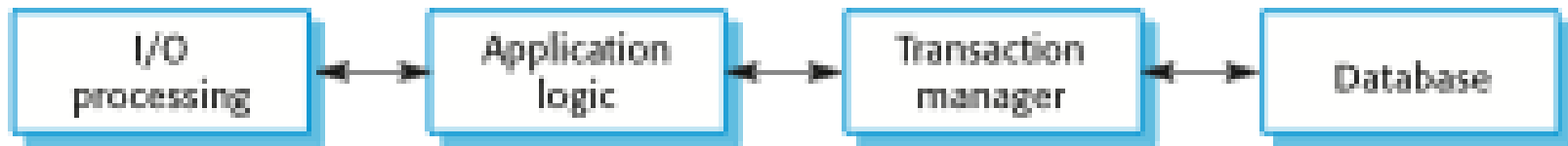
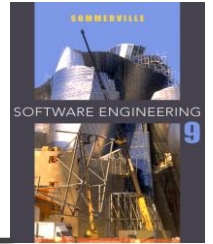
Application type examples

- ✧ Focus here is on transaction processing and language processing systems.
- ✧ Transaction processing systems
 - E-commerce systems;
 - Reservation systems.
- ✧ Language processing systems
 - Compilers;
 - Command interpreters.

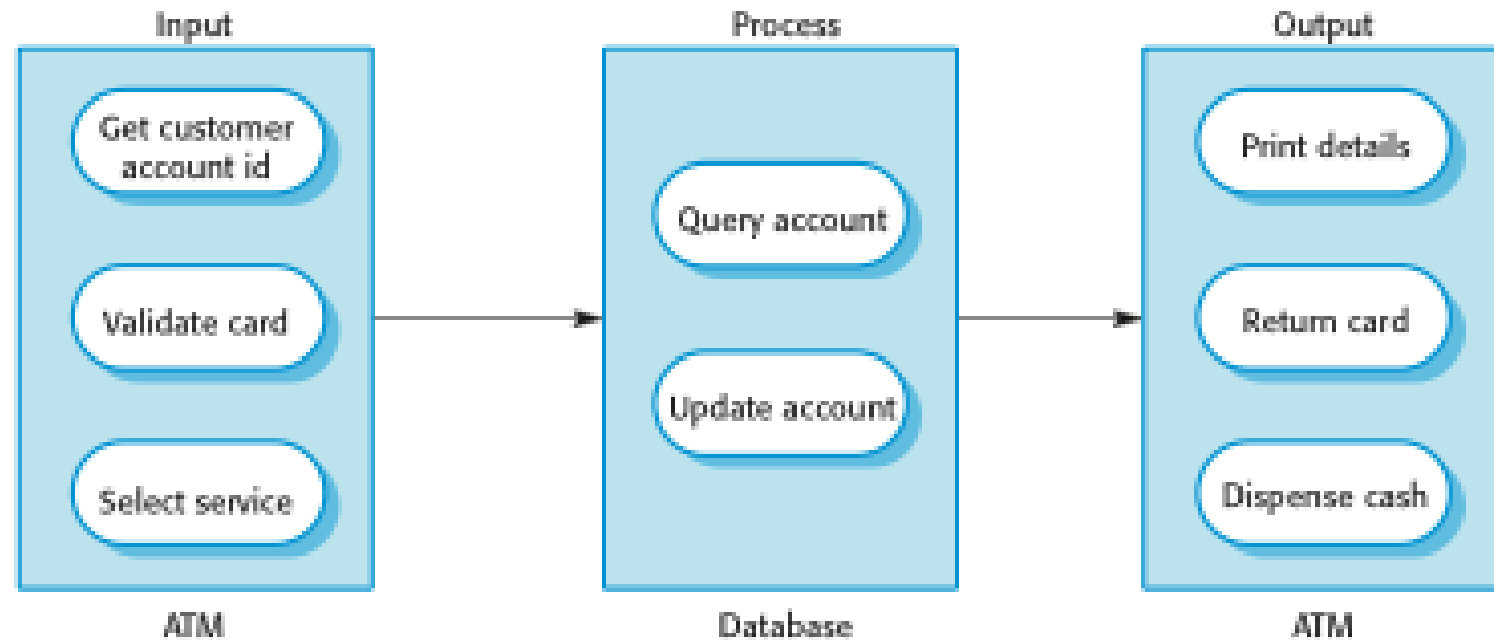
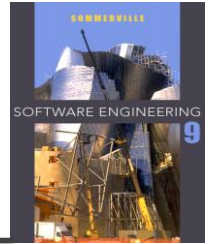
Transaction processing systems

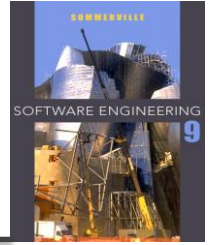
- ✧ Process user requests for information from a database or requests to update the database.
- ✧ From a user perspective a transaction is:
 - Any coherent sequence of operations that satisfies a goal;
 - For example - find the times of flights from London to Paris.

The structure of transaction processing applications



The software architecture of an ATM system

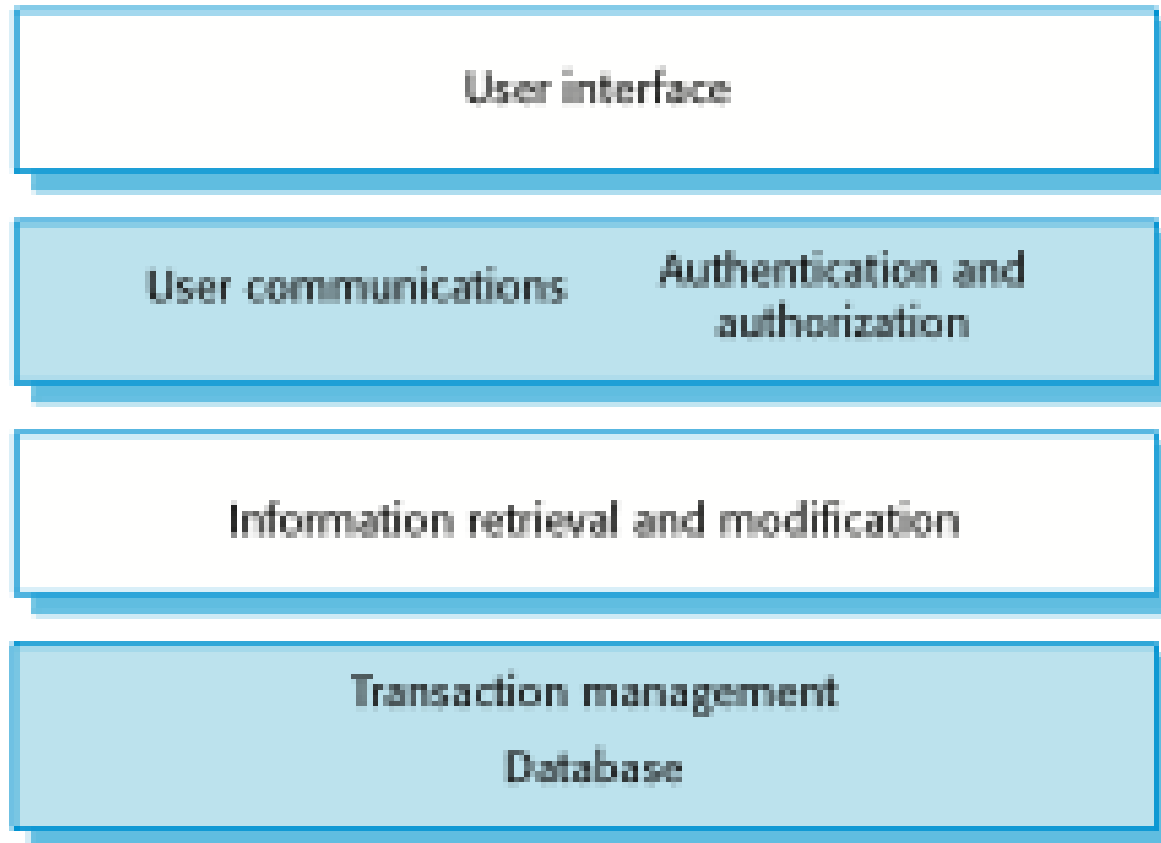




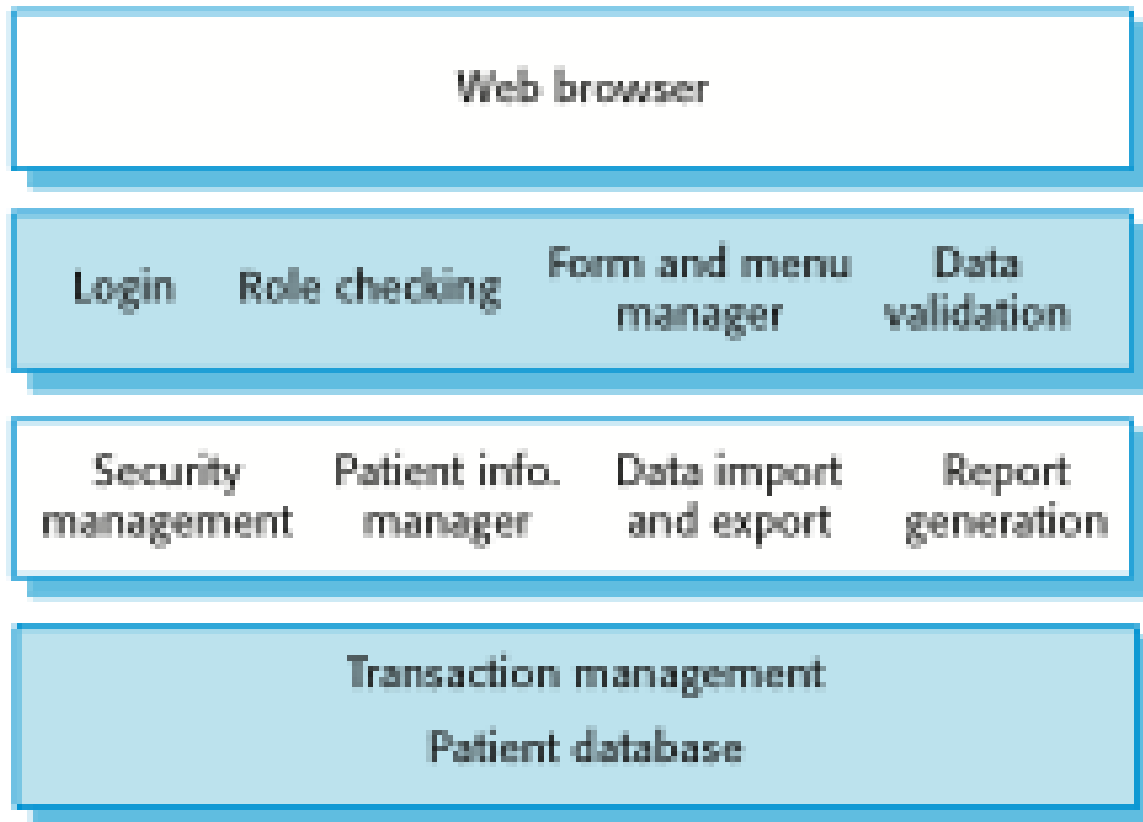
Information systems architecture

- ✧ Information systems have a generic architecture that can be organized as a layered architecture.
- ✧ These are transaction-based systems as interaction with these systems generally involves database transactions.
- ✧ Layers include:
 - The user interface
 - User communications
 - Information retrieval
 - System database

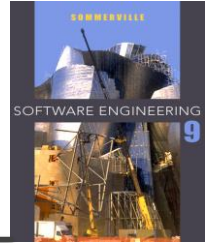
Layered information system architecture



The architecture of the MHC-PMS

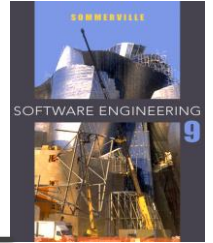


Web-based information systems



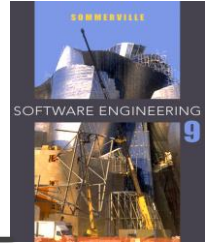
- ✧ Information and resource management systems are now usually web-based systems where the user interfaces are implemented using a web browser.
- ✧ For example, e-commerce systems are Internet-based resource management systems that accept electronic orders for goods or services and then arrange delivery of these goods or services to the customer.
- ✧ In an e-commerce system, the application-specific layer includes additional functionality supporting a 'shopping cart' in which users can place a number of items in separate transactions, then pay for them all together in a single transaction.

Server implementation



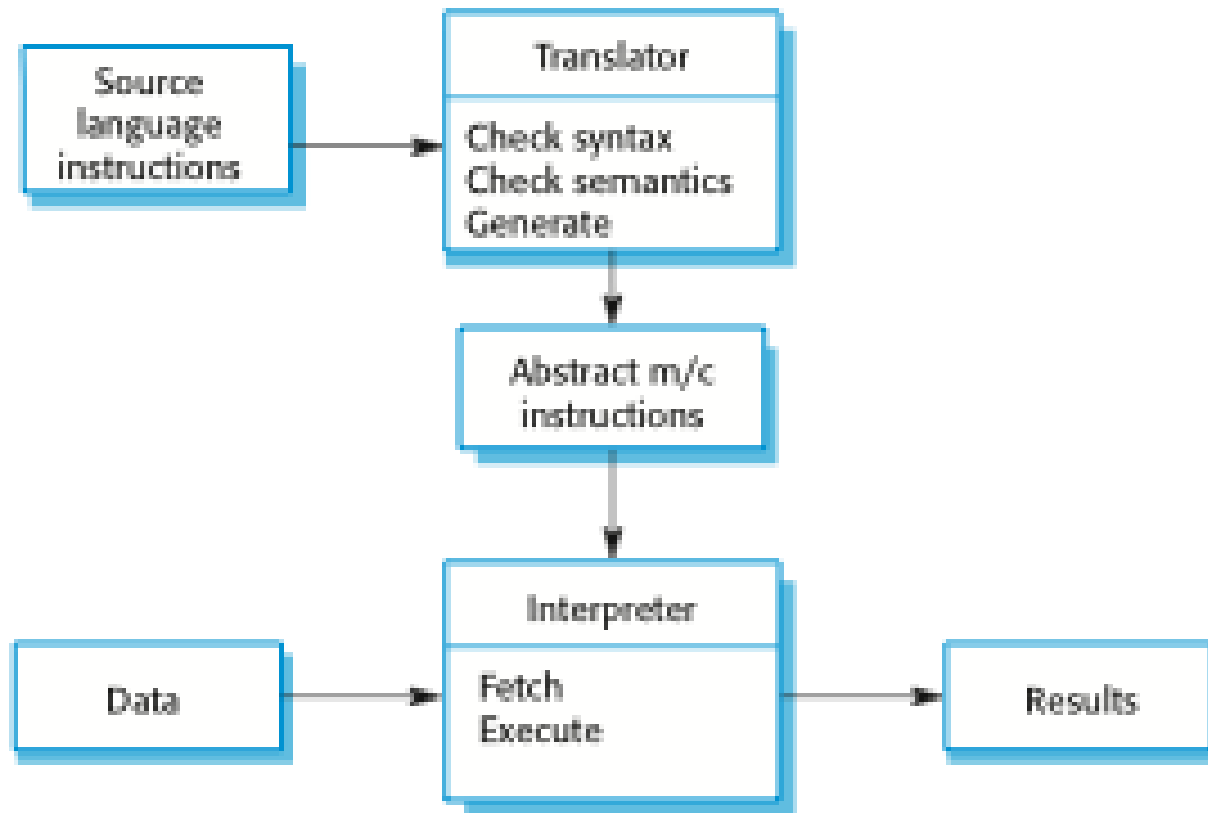
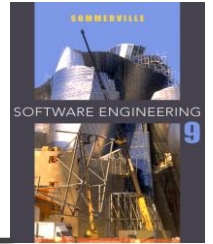
- ✧ These systems are often implemented as multi-tier client server/architectures (discussed in Chapter 18)
 - The web server is responsible for all user communications, with the user interface implemented using a web browser;
 - The application server is responsible for implementing application-specific logic as well as information storage and retrieval requests;
 - The database server moves information to and from the database and handles transaction management.

Language processing systems

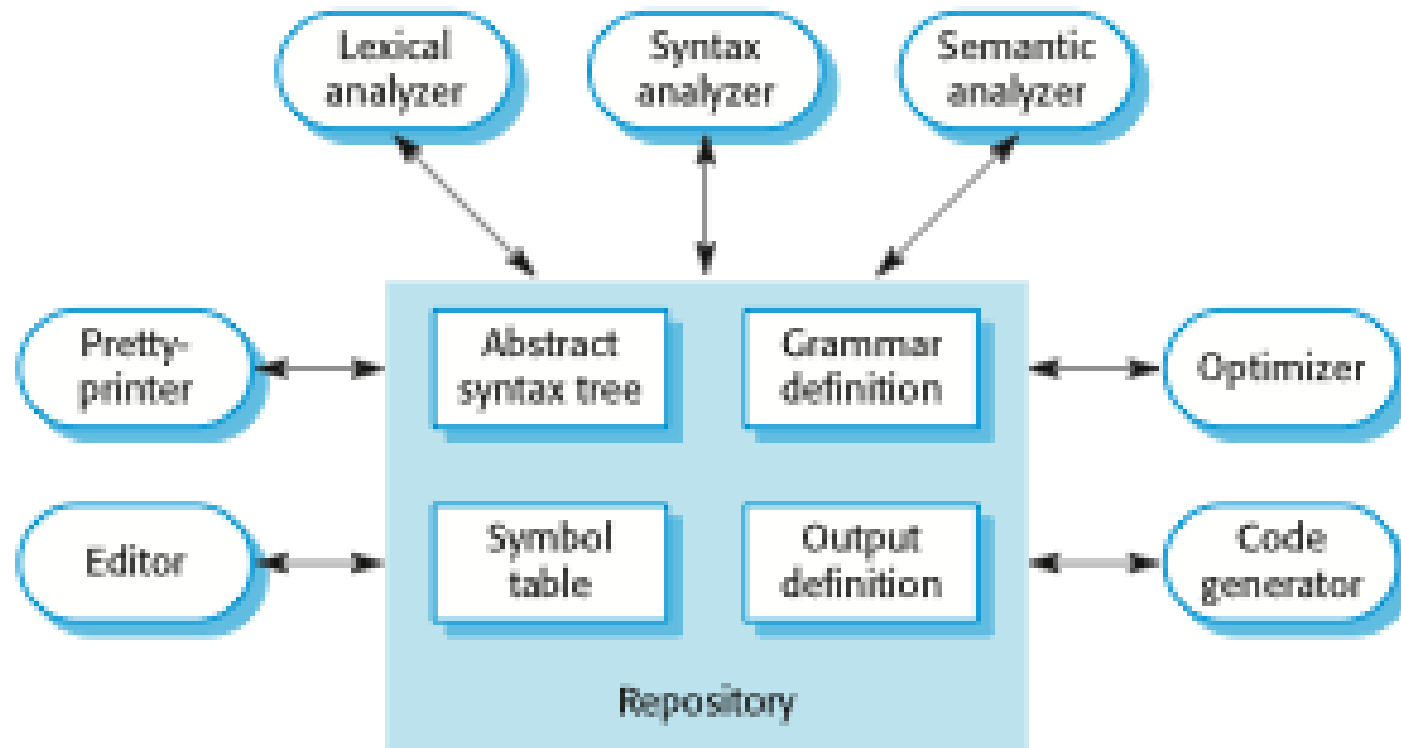
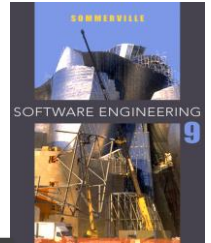


- ✧ Accept a natural or artificial language as input and generate some other representation of that language.
- ✧ May include an interpreter to act on the instructions in the language that is being processed.

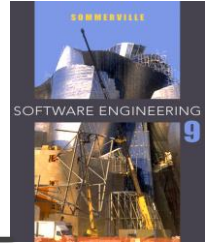
The architecture of a language processing system



A repository architecture for a language processing system



Key points



- ✧ Models of application systems architectures help us understand and compare applications, validate application system designs and assess large-scale components for reuse.
- ✧ Transaction processing systems are interactive systems that allow information in a database to be remotely accessed and modified by a number of users.
- ✧ Language processing systems are used to translate texts from one language into another and to carry out the instructions specified in the input language. They include a translator and an abstract machine that executes the generated language.