Engenharia de Software

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Aula 1

CASE STUDIES

A personal insulin pump

An embedded system in an insulin pump used by diabetics to maintain blood glucose control.

CS01

Airbus 340 flight control system

Architecture of the Airbus 340 flight control system, a safety critical system that implements the fly-by-wire flight system on the Airbus.

CS02

Ariane 5 launch accident

CS03

Describes the accident that occurred on the initial launch of the Ariane 5 rocket, a launcher developed by the European Space Agency.

CS04

iLearn: a digital learning environment

A system to support learning in schools

CASE STUDIES

INSULIN PUMP CONTROL SYSTEM

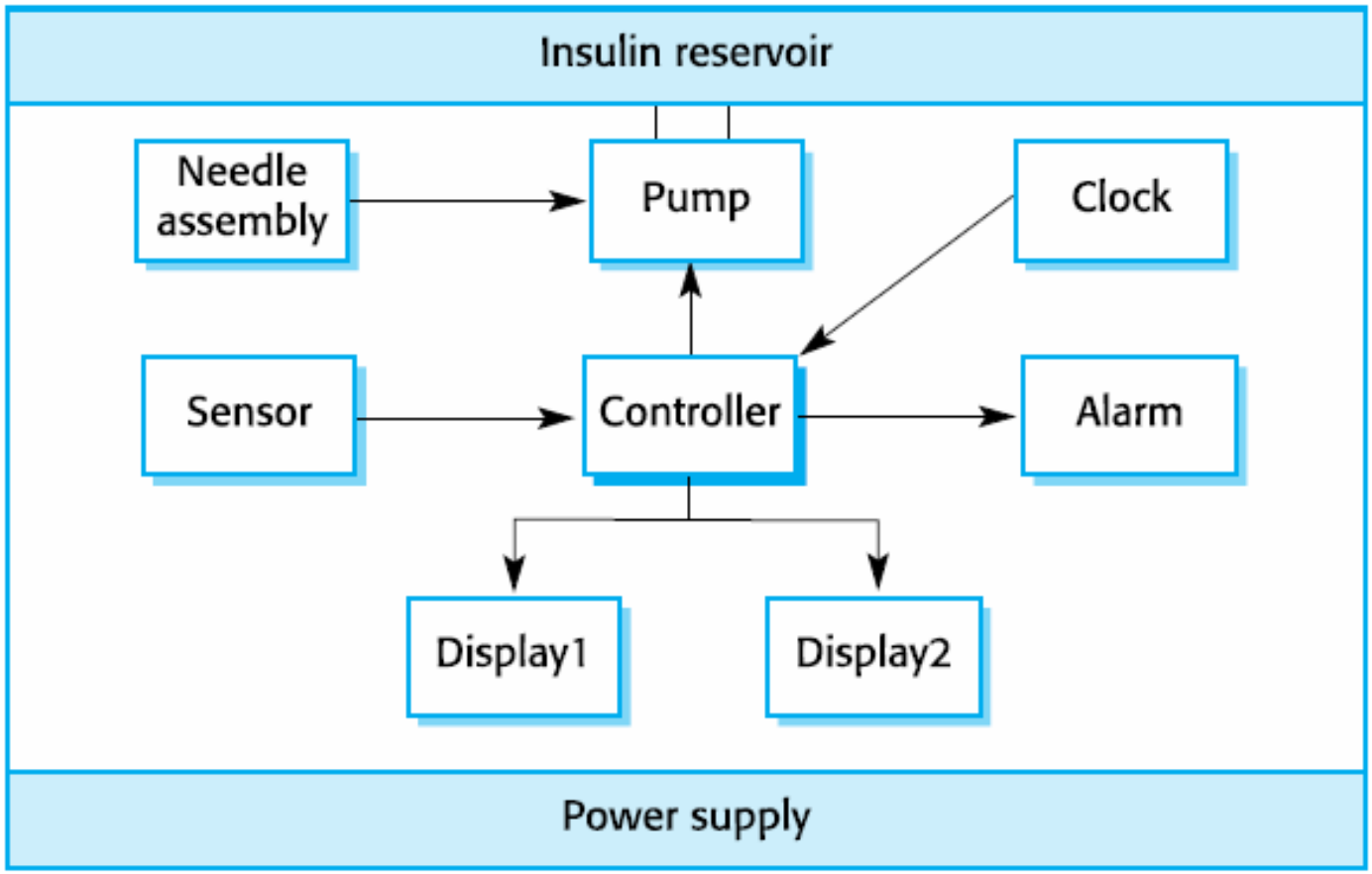
CS01

INSULIN PUMP CONTROL SYSTEM

- Collects data from a blood sugar sensor and calculates the amount of insulin required to be injected.
- Calculation based on the rate of change of blood sugar levels.
- Sends signals to a micro pump to deliver the correct dose of insulin.
- Safety critical system as low blood sugars can lead to brain malfunctioning, coma and death; high blood sugar levels have long term consequences such as eye and kidney damage.

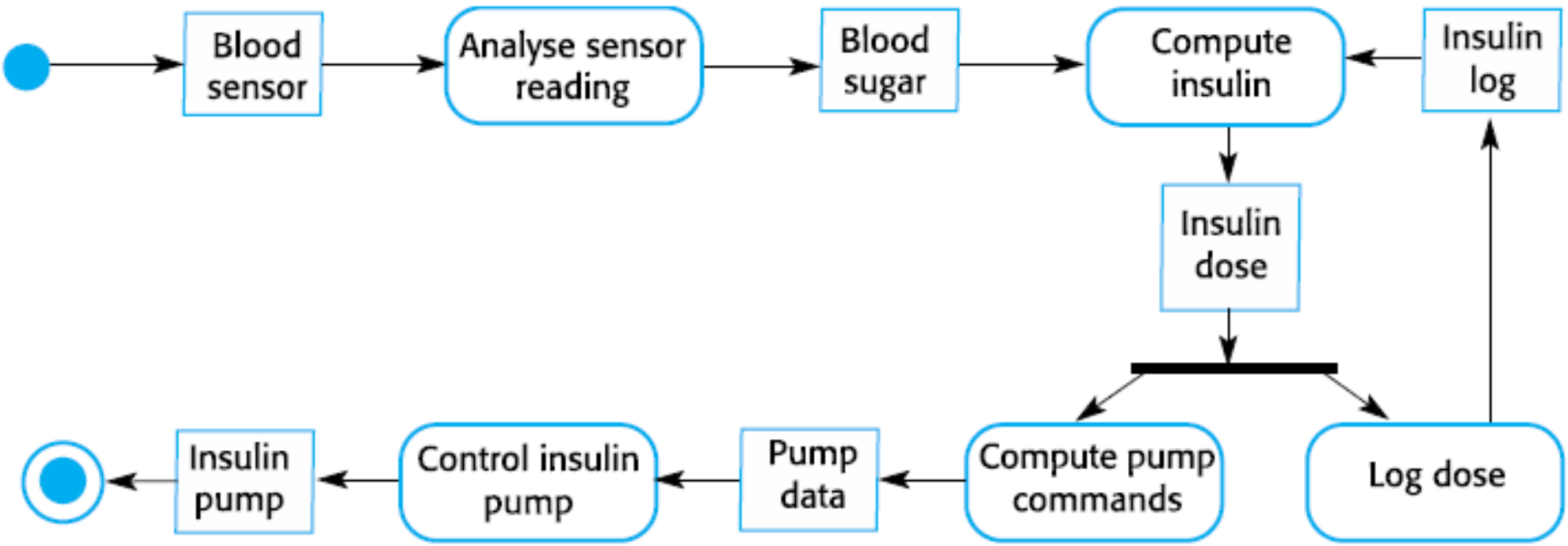
CS01

INSULIN PUMP HARDWARE ARCHITECTURE



CS01

ACTIVITY MODEL OF THE INSULIN PUMP



CS01

ESSENTIAL HIGH LEVEL REQUIREMENTS

The system shall be available to deliver insulin when required.

The system shall perform reliably and deliver the correct amount of insulin to counteract the current level of blood sugar.

The system must therefore be designed and implemented to ensure that the system always meets these requirements.

CASE STUDIES

AIRBUS 340 FLIGHT CONTROL SYSTEM

CS02

AIRBUS 340 FLIGHT CONTROL SYSTEM

Explains the organization of the safety-critical flight control system on the Airbus 330/340 and how redundancy and diversity is used in that system

CASE STUDIES

ARIANE 5 LAUNCH ACCIDENT

CS03

ARIANE 5 LAUNCH ACCIDENT

A video of the take-off and explosion after 37 seconds

https://youtu.be/ZY2J4p86oPw

CS03

ARIANE 5 LAUNCH ACCIDENT

Explains why a software failure on the first launch of the Ariane 5 rocket was responsible for the failure and complete destruction of the rocket and its payload

https://www.youtube.com/watch?v=W3YJeoYgozw

CASE STUDIES

ILEARN: A DIGITAL LEARNING ENVIRONMENT

CS04

iLEARN: A DIGITAL LEARNING ENVIRONMENT

- A digital learning environment is a framework in which a set of general purpose and specially designed tools for learning may be embedded plus a set of applications that are geared to the needs of the learners using the system.

- The tools included in each version of the environment are chosen by teachers and learners to suit their specific needs.
  - These can be general applications such as spreadsheets , learning management applications such as a Virtual Learning Environment (VLE) to manage homework submission and assessment, games and simulations.

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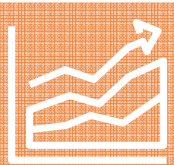
SERVICE ORIENTED SYSTEMS

The system is a service oriented system with all system components considered to be a replaceable service.



This allows the system to be updated incrementally as new services become available.

It also makes it possible to rapidly configure the system to create versions of the environment for different groups such as very young children who cannot read, senior students, etc.

CS04

ILEARN SERVICES

- *Utility services* that provide basic application-independent functionality and which may be used by other services in the system.
- *Application services* that provide specific applications such as email, conferencing, photo sharing etc. and access to specific educational content such as scientific films or historical resources.
- *Configuration services* that are used to adapt the environment with a specific set of application services and do define how services are shared between students, teachers and their parents.

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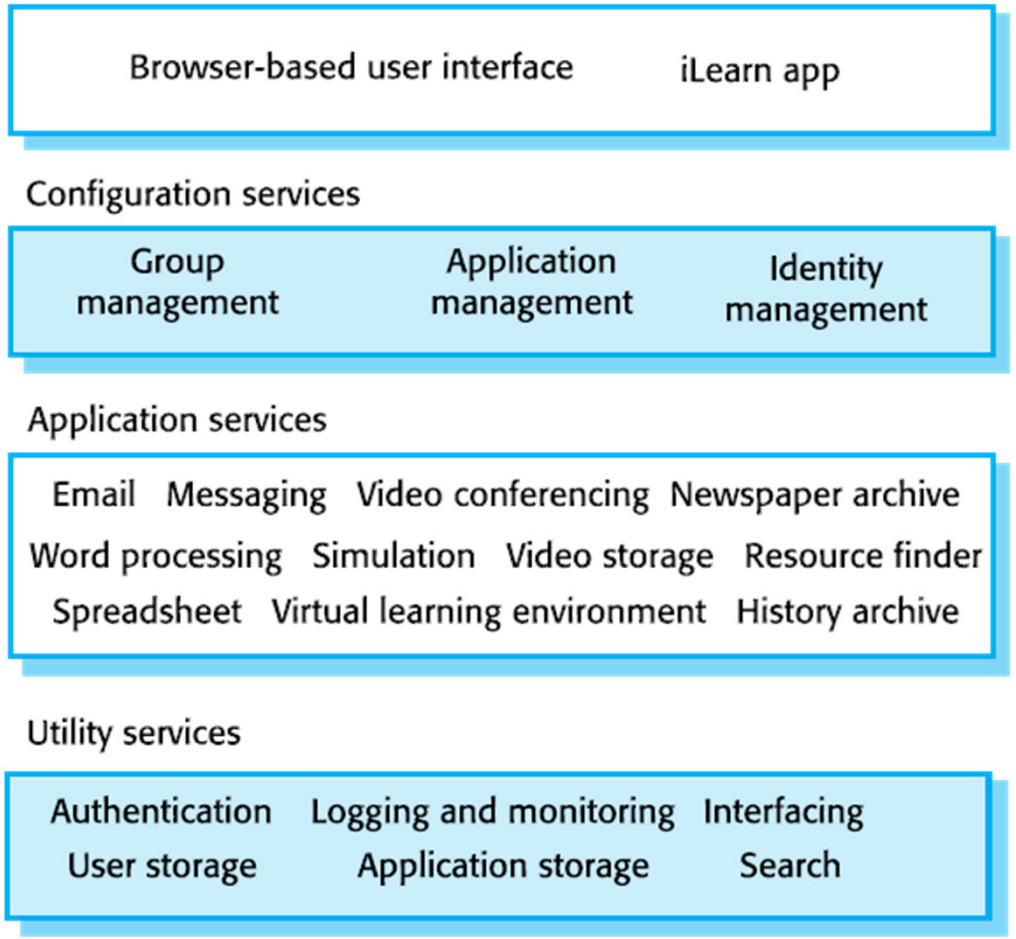
ILEARN ARCHITECTURE



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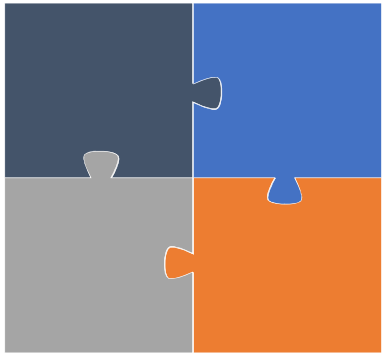
ILEARN SERVICE INTEGRATION

- Integrated services are services which offer an API (application programming interface) and which can be accessed by other services through that API. Direct service to service communication is therefore possible.
- Independent services are services which are simply accessed through a browser interface and which operate independently of other services. Information can only be shared with other services through explicit user actions such as copy and paste; re authentication may be required for each independent service.

KEY POINTS

Essential software product attributes are maintainability, dependability and security, efficiency and acceptability.

Software engineering is an engineering discipline that is concerned with all aspects of software production.



The fundamental notions of software engineering are universally applicable to all types of system development.

The high level activities of specification, development, validation and evolution are part of all software processes.

KEY POINTS

The fundamental ideas of software engineering are applicable to all types of software system.

There are many different types of system and each requires appropriate software engineering tools and techniques for their development.

Software engineers have responsibilities to the engineering profession and society. They should not simply be concerned with technical issues.

Professional societies publish codes of conduct which set out the standards of behaviour expected of their members.