|  |  |
| --- | --- |
| Potential Error with SQL implemented Application   * Connection issue * SQL syntax error * NULL value error * Log in error * Empty Result | Error Messages Should Never Be Visible To Users   * Internal Logics * Internal Relations * Database Vulnerability * Potential to SQL Injection Attacks |

Protection Against SQL Injections

|  |  |
| --- | --- |
| Anonymous Parameter | Named Parameter |
| Cur.execute(“SELECT name  FROM Student  WHERE sid = %s”,(stdid,)) | Cur.execute(“  SELECT name  FROM student  WHERE sid = %{sid}s“,  {‘sid’:stdid}  ) |

This is so that any input from user will be checked in the function cur.execute() function and it’s built in security checking functionality

# Stored procedure

* SQL functions that are stored in DBMS and users have access to **calling** the function.
  + Logic is not visible even to the application layer
* **CALL** functionname()

|  |  |
| --- | --- |
| Pro | Con |
| * Security   + Access privileges on stored procedures and not any of the databases that the logic requires * Efficiency   + Instead of sending all the SQL commands via online you only send the request for one procedure call. * Correctness   + Avoid pitfall of wrong transaction boundaries by controlled function calls * Improved Maintainability * Central Code-base for all applications’ * Reduced Data transfer * DBMS centric Security * Access to all tables. | * Good design needed * Difficult to debug * Separate language to learn * Only meant for functions that happen at regular basis |

# Password Security

* Never store Password as a string value in SQL

|  |  |
| --- | --- |
| Has Function | Salting |
| * **Hashing** is a method in which you **feed** **given** **text** **field** **value** of the password into a **function** to convert it into **non-human readable format** that either gets **verified/validated** to check for user authorization or to **store passwords** * Should be done in **application** layer and not in **DBMS** layer   + Faster access   + Less sensitive data transmitted through internet | Salting is a method of **inserting a random text** into the **password** to the inputted text field value into another value that would result in a **more complex process** for the **hash function.**  Merge of functions to make hash value more complex. |

# Data Encryption methods

* Data Minimalism
* Strong Encryption
* Consult expert > implement from scratch

# Data Structures

|  |  |  |
| --- | --- | --- |
| Unstructured | Semi-Structured | Structured |
| * Data that cannot be easily organized into rows and columns * Difficult to search, manage and analyze   + Text document   + Video   + Audio Files | Mix of both types of data that can have both structured and unstructured section in data   * Emails   + Sender, receiver CC     - structured   + Body of email     - unstructured | Data that is structured in an interactive format with **rows and column** and can be mapped into predefined **schema**   * rational table * excel spreadsheet |

Method of analysis

|  |  |
| --- | --- |
| Unstructured | Structured |
| 1. First get the data 2. try to understand the format of the content 3. read data definition 4. interpret the data 5. implement data fact | 1. Schema First 2. reading data 3. interpret the data 4. implement data facts |

# Ontology

|  |  |
| --- | --- |
| * Method to construct and define a vocabulary for **unstructured data** * Explicit and formal specification of information in a domain   + Concept   + Properties   + Attributes   + Constraints on properties and attributes   + Individual instances | *“formal, explicit specification of shared conceptualization”*   * Formal   + Machine readable and processable * Explicit   + Something in concrete form * Conceptualization   + Defines an abstract model describing a field of knowledge or domain |

# Responsibility of an ontology

* Defining the **concept**/**classes** in the **domain** **of** **interest**
* Arranging the **classes** into **class-subclass format**
* Specifying the **relationships between concepts**
* Create Vocabulary for describing domain knowledge and provide explicit specification of intended meanings
* Creation of **Knowledge** **graph**

# Knowledge Graph

* **Formal description** of a **certain knowledg**e that can be **accessed and explored by machine**
* Large integrated ontologies that represent the knowledge by **modeling the objects in the world and their relationships**
* GOOGLE SEARCH ENGINE IS A KNOWLWEDGE GRAPH

# Semantic Web

* Allow **web-based** knowledge data available for analysis and linking