Sql antipatterns pdf

Storing a list of IDs as a VARCHAR/TEXT column can cause performance and data integrity issues. Asking against such a column would require using pattern-matching expressions. It's cumbersome and costly to join a comma-separated list to matching rows. This will make it harder to validate IDs. Think about what is the largest number of items this list must support? Instead of using a multivalued attribute, consider storing it in a separate table, so that each individual value for that attribute occupies a separate row. Such an intersection table implements a many-to-many relationship between the two referenced tables. This will simplify querying and validating the IDs at high time. Recursive dependence Avoid recursive relationships: It is common for data to have recursive relationships. Data can be organized in a tree-like or hierarchical way. However, creating a foreign key constraint to enforce the relationship between two columns in the same table adds to the troublesome query. Each level in the tree corresponds to a different join. You will need to issue recursive questions to get all subordinates or all ancestors to a node. One solution is to construct an additional closing table. It's about storing all the paths through the tree, not just those with a direct parent-child relationship. You may want to compare different hierarchical data designers — closing table, path enumeration, nested sets — and pick one based on your application's needs. Primary key does not exist Consider adding a primary key: A primary key constraint is important when you need to do the following: prevent a table from containing duplicate rows, refer to individual rows in queries, and support foreign key references If you don't use primary key constraints, you create a tricky task for yourself: checking duplicate rows. More often than not, you need to define a primary key for each table. Use compound keys when they are appropriate. Generic Primary Key Skip using a general primary key (id): Adding an id column to each table causes multiple effects that make its use appear arbitrary. You can stop creating a redundant key or allow duplicate rows if you add this column to a composite key. The name id is so generic that it doesn't matter. This is especially important when you join two tables and they have the same primary key column name. Foreign Key does not exist Consider adding a foreign key: Are you leaving out application restrictions? While it seems first to skip foreign important limitations making your database design easier, more flexible or faster, you pay for this in other ways. It becomes your responsibility to write code to ensure referential integrity manually. Use restrictions for foreign to enforce referential integrity. Foreign keys have another feature that you cannot imitate by using application code: cascade updates to multiple tables. This feature allows you to update or delete the parent row and allow the database to take care of any child rows that reference it. The way you declare the ON UPDATE or DELETE statements in the foreign key constraint allows you to check the results of a cascade operation. Make your database mistake-proof with limitations. Entity-Attribute-Value Pattern Dynamic schema with variable attributes: Are you trying to create a schema where you can define new attributes at runtime.? This means that attributes are stored as rows in an attribute table. This is called the Entity-Attribute-Value or schemaless pattern. When using this pattern, you sacrifice many benefits that a conventional database design would have given you. You cannot make required attributes. You cannot force referential integrity. You may find that attributes are not named consistently. One solution is to store all related types in a table, with distinct columns for each attribute that is in any type (Single Table Inheritance). Use an attribute to define the subtype of a given line. Many attributes are subtype-specific, and these columns must be given a null value on any row that stores an object for which the attribute does not apply the columns with non-null values to become sparse. Another solution is to create a separate table for each subtype (Concrete Table Inheritance). A third solution mimics inheritance, as if tables were object-oriented classes (Class Table Inheritance). Create a single table for the base type, containing attributes that are common to all subtypes. Then for each subtype, create a different table, with a primary key that also acts as a foreign key to the base table. If you have many subtypes, or if you need to support new attributes frequently, you can add a BLOB column to store data in a format such as XML or JSON, which encodes both the attribute names and their values. This design is best when you can't limit yourself to a finite set of subtypes and when you need complete flexibility to define new attributes at any time. Metadata Tribbles Store each value with the same meaning in a single column: Creating multiple columns in a table indicates that you are trying to store a multivalued attribute. This design makes it difficult to add or remove values, to ensure the uniqueness of values and management of growing sets of values. The best solution is to create a dependent table with a column for the multivalued attribute. Store the multiple values in multiple rows instead of multiple columns. Also define a foreign key in the dependent table to associate the values with its parent row. Break down a table or column by year: You might try to split a single column into multiple columns, using column names based on distinct values in another attribute. Each year, you need to add an additional table. You mix metadata with data. You will now need to ensure that the primary primary values are unique across all split columns or tables. The solution is to use a function called sharding or sharding. (PARTITION BY HASH (YEAR(...)). With this feature, you can get the benefits of splitting a large table without the drawbacks. Partitioning is not defined in the SQL standard, so each brand of the database implements it in its own non-standard way. Another remedy for metadata tribbles is to create a dependent table. Instead of one row per multi-column entity for each year, use multiple rows. Don't let data spawn metadata. Physical Database Design Anti-Pattern Virtually any use of FLOAT, REAL, or DOUBLE PRECISION data types is suspicious. Most applications that use floating point numbers do not require the range of values supported by IEEE 754 format. The cumulative effect of imprecise floating point numbers is severe when calculating aggregates. Instead of FLOAT or its siblings, use the NUMERIC or DECIMAL SQL data types for fixed-precision fractional numbers. These data types store numeric values accurately, up to the precision you specify in the column definition. Do not use FLYT if you can avoid it. Values in definition Do not enter values in column definition: Enum declares the values as strings, but internally stores the column as the ordinal number for the string in the list enumerated. Therefore, the storage is compact, but when you sort a query by this column, the result is organized by the ordinal value, not alphabetically by string value. You may not expect this behavior. There is no syntax to add or remove a value from an ENUM or check the constraint you can only redefine the column with a new set of values. In addition, if you make a value obsolete, you can interfere with historical data. As a matter of policy, changing metadata - that is, changing the definition of tables and columns - should be infrequent and with attention to testing and quality assurance. There is a better solution for limiting values in a column: create a one-line lookup table for each value you allow. Then explain a foreign key constraint on the old table that refers to the new table. Use metadata when validating against a fixed set of values. Use data when validating against a fluid set of values. Files are not SQL Data Types Resources outside the database are not managed by the database: It is common for programmers to be unambiguous that we should always store files external to the database. Files do not obey DELETE, transaction isolation, restore, or work well with database backup tools. They do not obey SQL access privileges and are not SQL data types. Resources outside the database are not managed by the database. You should consider storing blobs inside the repository instead of in external files. You can save in a BLOB column in a file. Too many indexes don't create too many indexes: You take advantage of an index if you are running queries that use that index. There is no advantage to creating indexes that you don't use. If you cover a database table with indexes, you incur a lot of overhead without the assurance of payoff. Consider releasing unnecessary indexes. If an index provides all the columns we need, then we don't have to read rows of data from the table at all. Consider using such cover indexes. Know your data, know your queries, and maintain the right set of indexes. Index attribute order Adjust the index attribute order of queries: If you create a composite index for the columns, make sure that the query attributes are in the same order as the index attributes, so that the DBMS files can use the index while you process the query. If query and index attribute orders are not adjusted, then DBMS may not be able to use the index during query processing. Example CREATE INDEX Phone Book ON Accounts(last_name, first_name) SELECT * FROM Accounts ORDERS OF first_name, last_name Query Anti-Pattern When you select *, you often retrieve more columns from the database than your application really needs to work. This allows more data to be moved from the database server to the client, slowing down access and increasing the load on your machines, and taking more time to travel across the network. This is especially true when someone adds new columns to underlying tables that did not exist and were not needed when the original consumers encoded their data access. Indexing issues: Consider a scenario where you want to set a query to a high level of performance. If you were to use *, and it returned more columns than you actually needed, the server would often have to perform more expensive methods to retrieve your data than it would otherwise be able to. For example, you wouldn't be able to create an index that simply covered the columns in your SELECT list, and even if you did (including all columns [Russian]), the next guy who came around and added a column to the underlying table would cause the optimizer to ignore your optimized opaque index, and you'd likely find that the performance of your query would drop significantly for no easy apparent reason. Binding problem: When you select *, it is possible to retrieve two columns with the same name from two different tables. This can often crash your data consumer. Imagine a query that unites two tables, both of which contain a column called \ID. How would a consumer know which was which? SELECT* can also confuse views (at least in some versions SQL Server) when underlying table structures change -- the view is not rebuilt, and the data that comes back can be nonsense. And the worst part of it is that you can be sure to name your columns what you want, but the next guy who comes along may not have any way of knowing that he has to worry about adding a column that will clash with youralready Name. Use of NULL use NULL use as a Unique Value: NULL is not the same as zero. A number ten larger than an unknown is still an unknown. NULL is not the same as a zero-length string. If you combine any string with NULL in standard SQL, NULL returns. NULL is not the same as false. Boolean expressions with AND, OR, and NOT also produce results that some people find confusing. When you declare a column as NOT NULL, it should be because it would be pointless for the row to exist without a value in that column. Use null to denote a missing value for any data type. DO NOT NULL use DO NOT use NULL only if the column cannot have a missing value: When you declare a column as NOT NULL, it should be because it would be pointless for the row to exist without a value in that column. Use null to denote a missing value for any data type. String Concatenation Use COALESCE for string concatenation of nullable columns: You may need to force a column or expression to be non-null to simplify query logic, but you don't want that value to be stored. Use the COALESCE function to construct the concatated expression so that a null-valued column does not make the entire expression null. Example SELECT first_name || COALESCE(' ' || middle_initial || ' ', ' ') || last_name AS full_name FROM Accounts GROUP OF Usage Do not refer to non-grouped columns: Each column in the select list of a query must have a single valued per row group. This is called the rule for a value. Columns named in the GROUP BY clause are guaranteed exactly one value per group, regardless of how many rows of group matches. Most DBMS files report an error if you try to run a query that tries to return a column other than the columns named in the GROUP BY statement or as arguments to aggregate functions. Each expression in the selection list must be in either an aggregate function or the GROUP BY statement. Follow the rule with a value to avoid ambiguous query results. ORDER BY RAND Usage Sorting with a non-deterministic expression (RAND()) means that sorting cannot take advantage of an index: There is no index that contains the values returned by the random function. That's the point of being ran-dom: they are different and unpredictable every time they are selected. This is a problem for query performance, because using an index is one of the best ways to speed up sorting. The consequence of not using an index is that the query result set must be sorted by database by using a slow table search. One technique that avoids sorting the table is to select a random value between 1 and the largest primary key value. Another technique that avoids problems found in the previous options is to count the rows in the dataset and return a random number between 0 and Then use this number as a offset when you query the dataset. Some issues just can't be optimized consider taking a one Strategy. Pattern Matching Usage Avoid using vanilla pattern matching: The main drawback of pattern-matching operators is that they have poor performance. A second problem with simple pattern matching using LIKE or regular expressions is that it can find unintended matches. It is best to use a specialized search engine technology like Apache Lucene, instead of SQL. Another option is to reduce the recurring cost of searching by saving the result. Consider using vendor extensions as fulltext index in MySQL. More generally, you don't need to use SQL to solve every problem. Spaghetti Query Alert Divide a complex spaghetti issue into several simple queries: SQL is a very expressive language—you can accomplish a lot in a single question or statement. But that doesn't mean it's mandatory or even a good idea to approach each task with the assumption that it has to be done in a series of code. A common unintended consequence of producing all your results in one issue is a Cartesian product. This happens when two of the tables in the query have no condition that limits their relationship. Without such a limitation, pair the two tables pairs each row in the first table to each row in the second table. Each such pairing becomes a row of the result set, and you end up with many more rows than you would expect. It is important to keep in mind that these questions are simply difficult to write, difficult to change and difficult to troubleshoot. You should expect to receive regular requests for incremental improvements to your database applications. Managers want more complex reports and more fields in a user interface. Designing complex, monolithic SQL queries makes it more expensive and time-consuming to make improvements to them. Your time is worth something, both for you and for your project. Divide a complex spaghetti issue into several simple issues. When you split a complex SQL query, the result can be many similar queries, perhaps varying depending on the data values. Writing these queries is a tricky one, so it's a good application of SQL code generation. Although SQL makes it seem possible to solve a complex problem in a single line of code, don't be tempted to build a house of cards. Reduce the number of JOINs Reduce the number of JOINs: Too many JOINs are a symptom of complex spaghetti issues. Consider dividing the complex issue into many simpler issues, and reducing the number of JOINs Eliminating unnecessary distinct conditions Eliminate unnecessary distinct conditions: Too many distinct conditions are a symptom of complex spaghetti issues. Consider splitting the complex query into many simpler queries, and reducing the number of DISTINCT conditions It is possible that the DISTINCT condition has no effect if a primary key column is part of the result set of columns implicit column usage Explicit name columns: Although usage wildcards and unnamed columns meet the of minor typing, this habit creates several dangers. This can break the program refactoring and can damage performance. Always spell out all the columns you need, instead of relying on wild-cards or implicit column lists. HAVING Clause Usage Consider removing the HAVING statement: Rewriting the query HAVING statement to a predicate will enable the use of indexes during query processing. Example SELECT s.cust_id,count(s.cust_id) FROM SH.sales's GROUP BY s.cust_id HAVING s.cust_id != '1660' AND s.cust_id != '2' can be rewritten as: SELECT s.cust_id,count(cust_id) FROM SH.sales's WHERE s.cust_id != '1660' AND s.cust_id !='2' GROUP OF s.cust_id Nested subqueries Un-nest subqueries: Rewriting nested queries as connectors often leads to more efficient execution and optimization. In general, subquery-unlossis is always done for correlated subqueries with, at most, a table in the FROM statement, which is used in ANY, ALL, and EXISTS predicate. An unrearranged subquery, or a subquery with more than one table in the FROM clause, is simplified if it can be determined, based on query semantics, that the subquery returns a maximum of one line. Example SELECT * FROM SH.products p WHERE p.prod_id = (SELECT s.prod_id FROM SH.SALES s WHERE s.cust_id = 100996 AND s.quantity_sold = 1) can be rewritten as: SELECT p.* FROM SH.products p, sales s WHERE p.prod_id = s.prod_id AND s.cust_id = 100996 AND s.quantity_sold = 1 OR Use Consider using an IN predicate for questions about an indexed column: THE IN-list predicate can be used for indexed retrieval and also , optimizer can sort the IN list to match the index's sort sequence, which leads to more efficient retrieval. Note that the IN list must contain only constants, or values that are constant during a query block run, such as external references. Example SELECT s.* FROM SH.sales s WHERE s.prod_id = 14 OR s.prod_id = 17 can be rewritten as: SELECT s.* FROM SH.saless WHERE s.prod_id IN (14, 17) UNION usage Consider using UNION ALL if you don't care about duplicates: Unlike UNION that removes duplicates, UNION ALLOWS ALL DUPLICATES. If you don't care about dual tuples, then using UNION ALL would be a faster option. DISTINCT &amp; JOIN usage Consider using a subquery with EXISTS instead of DISTINCT: The DISTINCT keyword removes duplicates after sorting tuples. Instead, you can consider using a subquery with the KEYWORD EXISTS, you can avoid having to return an entire table. Example SELECT DISTINCT c.country_id, c.country_name from SH.countries c, SH.customers e WHERE e.country_id = c.country_id can be rewritten to: SELECT c.country_id, c.country_name FROM SH.COUNTRIES c WHERE EXISTS (SELECT 'X' FROM SH.customers e WHERE e.country_id = c.country_id) Application Development Anti-Pattern password in plain text or even to send it over the network in plain text. About About attackers can read the SQL statement you use to insert a password, they can see the password clearly. Additionally, interpolating the user's input string in the SQL query in plain text exposes it to the detection of an attacker. If you can read passwords, then a hacker can. The solution is to encode the password using a one-way cryptographic hash function. This function converts its input string into a new string, called a hash, that is unrecognizable. Use a salt to thwart dictionary attacks. Do not add the plain text password to the SQL query. Instead, calculate the hash in your application code, and use only hash in the SQL query. Source information Page 2 Store a list of IDs that a VARCHAR/TEXT column can cause performance and data integrity issues. Asking against such a column would require using pattern-matching expressions. It's cumbersome and costly to join a comma-separated list to matching rows. This will make it harder to validate IDs. Think about what is the largest number of items this list must support? Instead of using a multivalued attribute, consider storing it in a separate table, so that each individual value for that attribute occupies a separate row. Such an intersection table implements a many-to-many relationship between the two referenced tables. This will simplify querying and validating the IDs at high time. Recursive dependence Avoid recursive relationships: It is common for data to have recursive relationships. Data can be organized in a tree-like or hierarchical way. 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One solution is to store all related types in a table, with distinct columns for each attribute that is in any type (Single Table Inheritance). Use an attribute to define the subtype of a given line. Many attributes are subtype-specific, and these columns must be given a null value on any row that stores an object for which the attribute does not apply the columns with non-null values to become sparse. Another solution is to create a separate table for each subtype (Concrete Table Inheritance). A third solution mimics inheritance, as if tables were object-oriented classes (Class Table Inheritance). Create a single table for the base type, containing attributes that are common to all subtypes. Then for each subtype, create a different table, with a primary key that also acts as a foreign key to the base table. 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DO NOT NULL use DO NOT use NULL only if the column cannot have a missing value: When you declare a column as NOT NULL, it should be because it would be pointless for the row to exist without a value in that column. Use null to denote a missing value for any data type. String Concatenation Use COALESCE for string concatenation of nullable columns: You may need to force a column or expression to be non-null to simplify query logic, but you don't want that value to be stored. Use the COALESCE function to construct the concatated expression so that a null-valued column does not make the entire expression null. Example SELECT first_name || COALESCE(' ' || middle_initial || ' ', ' ') || last_name AS full_name FROM Accounts GROUP OF Usage Do not refer to non-grouped columns: Each column in the select list of a query must have a single valued per row group. This is called the rule for a value. 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It is important to keep in mind that these questions are simply difficult to write, difficult to change and difficult to troubleshoot. You should expect to receive regular requests for incremental improvements to your database applications. Managers want more complex reports and more fields in a user interface. Designing complex, monolithic SQL queries makes it more expensive and time-consuming to make improvements to them. Your time is worth something, both for you and for your project. Divide a complex spaghetti issue into several simple issues. When you split a complex SQL query, the result can be many similar queries, perhaps varying depending on the data values. Writing these queries is a tricky one, so it's a good application of SQL code generation. Although SQL makes it seem possible Solve a complex problem in a single line of code, do not be tempted to build a house of cards. Reduce the number of JOINs JOINs Number JOIN: For many JOINs is a symptom of complex spaghetti issues. Consider dividing the complex issue into many simpler issues, and reducing the number of JOINs Eliminating unnecessary distinct conditions Eliminate unnecessary distinct conditions: Too many distinct conditions are a symptom of complex spaghetti issues. Consider dividing the complex query into many simpler queries, and reducing the number of DISTINCT conditions It is possible that the distinct condition has no effect if a primary key column is part of the result set of columns Implicit Column Usage Explicit name columns: Even if you use wildcards and unnamed columns meet the goal of less typing, this habit creates multiple dangers. This can break the program refactoring and can damage performance. Always spell out all the columns you need, instead of relying on wild-cards or implicit column lists. HAVING Clause Usage Consider removing the HAVING statement: Rewriting the query HAVING statement to a predicate will enable the use of indexes during query processing. Example SELECT s.cust_id,count(s.cust_id) FROM SH.sales's GROUP BY s.cust_id HAVING s.cust_id != '1660' AND s.cust_id != '2' can be rewritten as: SELECT s.cust_id,count(cust_id) FROM SH.sales's WHERE s.cust_id != '1660' AND s.cust_id !='2' GROUP OF s.cust_id Nested subqueries Un-nest subqueries: Rewriting nested queries as connectors often leads to more efficient execution and optimization. In general, subquery-unlossis is always done for correlated subqueries with, at most, a table in the FROM statement, which is used in ANY, ALL, and EXISTS predicate. An unrearranged subquery, or a subquery with more than one table in the FROM clause, is simplified if it can be determined, based on query semantics, that the subquery returns a maximum of one line. Example SELECT * FROM SH.products p WHERE p.prod_id = (SELECT s.prod_id FROM SH.SALES s WHERE s.cust_id = 100996 AND s.quantity_sold = 1) can be rewritten as: SELECT p.* FROM SH.products p, sales s WHERE p.prod_id = s.prod_id AND s.cust_id = 100996 AND s.quantity_sold = 1 OR Use Consider using an IN predicate for questions about an indexed column: THE IN-list predicate can be used for indexed retrieval and also , optimizer can sort the IN list to match the index's sort sequence, which leads to more efficient retrieval. Note that the IN list must contain only constants, or values that are constant during a query block run, such as external references. Example SELECT s.* FROM SH.sales s WHERE s.prod_id = 14 OR s.prod_id = 17 can be rewritten as: SELECT s.* FROM SH.saless WHERE s.prod_id IN (14, 17) UNION usage Consider using UNION ALL if you don't care about duplicates: Unlike UNION that removes duplicates, UNION ALLOWS ALL DUPLICATES. If you don't care about dual tuples, then using UNION ALL would be a Options. Options. &amp; JOIN usage Consider using a subquery with EXISTS instead of DISTINCT: The DISTINCT keyword removes duplicates after you sort tuples. Instead, you can consider using a subquery with the KEYWORD EXISTS, you can avoid having to return an entire table. Example SELECT DISTINCT c.country_id, c.country_name from SH.countries c, SH.customers e WHERE e.country_id = c.country_id can be rewritten to: SELECT c.country_id, c.country_name FROM SH.countries c WHERE EXISTS (SELECT 'X' FROM SH.customers e WHERE e.country_id = c.country_id) Application development Anti-Pattern It is not safe to store a password in plain text or even to send it over the network in plain text. If an attacker can read the SQL statement you use to insert a password, they can see the password clearly. Additionally, interpolating the user's input string in the SQL query in plain text exposes it to the detection of an attacker. If you can read passwords, then a hacker can. The solution is to encode the password using a one-way cryptographic hash function. This function converts its input string into a new string, called a hash, that is unrecognizable. Use a salt to thwart dictionary attacks. Do not add the plain text password to the SQL query. Instead, calculate the hash in your application code, and use only hash in the SQL query. Source

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