Recursive CTEs Cursing Again and Again?

Cornelia „Conny“ Matthesius

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About me

- Industrial engineer stumbling into BI development in 2011
- Sysmex – a medical technology company
- Part of the SQL Server community - sharing cookies ☺
- Co-organizer of the Hamburg local PASS group

Why this topic?

- Production cost calculation needed a BOM explosion

Agenda

Tick...	Some basics on CTEs
Tick...	Recursion and recursive CTEs
BOOM!	BOM technician at work
...Aftermath	guidelines & performance

Common Table Expressions (CTE) basics

- Temporary named result set
- Usable within another statement SELECT/INSERT/UPDATE/DELETE
- No storage associated with a CTE, life-time of a CTE is constrained to the run time of a single query
- Part of ANSI SQL 99, introduced in SQL Server 2005, supported in all versions/editions since then

Common Table Expressions (CTE) basics

Demo 1

WHY? Simplify complex queries

- Improve readability and debugging
- Eliminate repetition without writing a view or the same subquery while reducing the possibility of mistakes
- CTEs can be nested and referenced multiple times from a calling query

- No change in performance of CTE (without recursion) compared to a view or subquery
- If a CTE is referenced multiple times, it will also run multiple times

WHY? Recursion

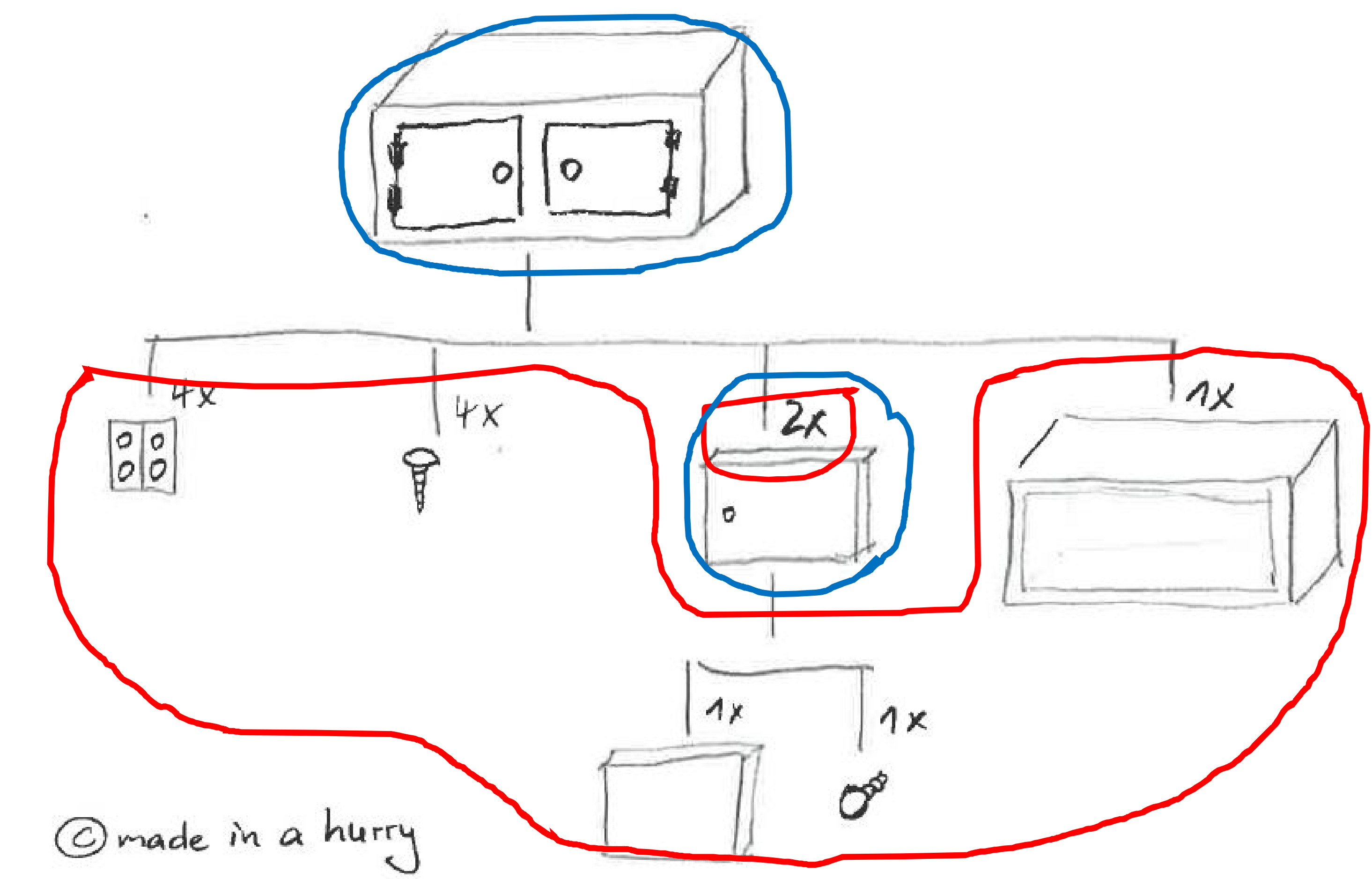
Recursion, *see Recursion*. ☺
recurrere: Latin word for „run back“

e.g. add the numbers from 1 to 5
Iteration: 1 + 2 + 3 + 4 + 5
Recursion: start: 1
1st run: (sum of numbers from 1 to 1) + 2
2nd run: (sum of numbers from 1 to 2) + 3
…
4th run: (sum of numbers from 1 to 4) + 5

Recursive CTE

Demo 2

Example: bill of material (BOM)



Example: bill of material (BOM)

Upfront considerations:

- Layout of your base table (parent/child with NULL headers?)
- How many levels do we expect? Does this change over time?
- Added field for BOM level
- Added field for sort order
- Who has to prevent circular references?

Example: bill of material (BOM) explosion

Demo 3

Guidelines for writing recursive CTEs

- Needs at least one anchor and one recursive member
- Multiple anchor/recursive members can be defined, but make sure all anchors are defined first to return complete result set
- Number of columns & their data type must match (UNION ALL)
- FROM clause of the recursive member can only refer to the cte_expression once
- Use a defined termination check
- Consider appropriate MAXRECURSION settings

Guidelines for writing recursive CTEs

Not allowed in recursive member query

- GROUP BY
- HAVING
- LEFT/RIGHT/OUTER JOINs (INNER JOIN is allowed)
- SELECT DISTINCT
- Subqueries
- TOP

Recursive CTEs & performance

- Might meet expectations on small data sets, faster than other approaches
- Will become an slower once data sets increase

- Indexes cannot be added to the CTE itself, but make sure that the recursive part has a suitable index

Further reads

- www.essentialsql.com
- Common Table Expressions Joes 2 Pros: A CTE tutorial on Performance, Stored Procedures, Recursion, Nesting and the use of Multiple CTEs
- https://dba.stackexchange.com/questions/73115/how-to-write-a-query-which-finds-all-circular-references-when-a-table-references ->last entry
- http://www.sqlservercentral.com/articles/T-SQL/100061/

Questions?

cma@sqlpass.de

c.matthesius@web.de

Thank you!