**Solution:**

The most detailed grain is the combination of individual product or service, individual customer, and date (for special events, only customer and date).

Total Rows : 50000

Unique Items : 500

ServicePurchase rows / year : 100000

Unique ServCategory rows : 20

Product Sales : 450,000

Customer number (product) : 50000

Customer number (service) : 50000

Customer number (special event) = 200\*150=30000

Fact table size (merchandize product sales) is determined as 450000 purchases / year

Fact table size (service sales) is determined as 100000 purchases / year (including service)

Fact table size (special event sales) is determined as 300\*200=60000 purchases / year

**Sparsity estimate:**

*Product of dimensions*

=1-(fact table size / product of dimensions )

=1-(450000/(500\*50000\*365)) = 0.9995

The data cube has mostly missing cells with 0.0005% of cells with non-zero values.

*Service of dimensions*

=1-(fact table size / service of dimensions )

=1-(100000/(20\*50000\*365)) = 0.997

The data cube has mostly missing cells with 0.003% of cells with non-zero values.

*Special Events of dimensions*

=1-( fact table size / special events of dimensions )

=1-(60000/(30000\*365)) = 0.995

The data cube has mostly missing cells with 0.005% of cells with non-zero values.