**Q3.**

The individual grain should track merchandise or services sold for individual customers at each individual franchise along the time.

Sparsity calculations:

Sparsity = 1 – Fill Ratio

Sparsity = 1 - Fact table size / product of dimension tables

Fill Ratio is given by:

Fact Table rows / [Franchise rows] \*[Merchandise or service table rows] \*[Date Dimension rows] \*[Member/customer]

**1. Fact Table size calculations:**

* Total merchandise sales = 450,000
* Total service purchase rows = 100,00
* 300 special events for franchise per year with 200 franchises participating.

Therefore, total rows = 450,000 + 100,000 + 300\*200 = 610,000 per year

**Dimension Tables:**

**2.**  Total rows in franchise table = 350

**3.** Total rows in Date dimension = 365

**4.** Total rows from customer or member table can be calculated as:

* 50,000 people from member table
* 150 unique customers are participating per special event in work sheet and there are 200 franchises

Therefore, total customers from both database and spread sheet are:

50,000 + 150\*200 = 50,000 + 30,000 = 80,000

**5.** Merchandise or Service type table size = 500 (Merchandise rows) + 20 (ServCategory) + 1 (Spread sheet) = 521 rows

Therefore,

Fill Ratio = 610,000 / [350] \* [80000] \* [365] \* [521] = 1.145 \* 10^-7

Sparsity = 1 – Fill Ratio

Sparsity = 0.99999988543

From the above results we can say that, the data cube is mostly empty.