

What is Essbase BSO?

**Key Concepts for Basic Understanding ...
... in a 30-minute presentation!**

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July 2021

Agenda - What is Essbase BSO?

- 1 What is the Magic of Essbase? *Quick Review.*
- 2 What are Dimensions and Members? *The Basics for understanding BSO.*
- 3 What is a Block? *Dense & Spare: the link to everything BSO.*
- 4 How is Data Stored in BSO? *Blocks, blocks and more blocks!*
- 5 Where is Data Stored in BSO? *Ind/Pag files*
- 6 Types of Blocks. *All Blocks are the same size but what makes them different?*
- 7 Where to find BSO Cube Statistics? *And how do they relate to what we know?*



1. What is the Magic of Essbase?

Quick Review

BSO or ASO?

Extended **S**pread **S**heet **D**atabase

Aggregate **S**torage **O**ption : Large outlines, primarily aggregation

Block **S**torage **O**ption: Small outlines, complex analysis/calculation



Aggregate storage

REPORTING



Block storage

ANALYSIS / CALCULATION

	Jan	Feb
Lightbolt	166	182
Thunderball	131	149

The screenshot shows an Excel spreadsheet with a PivotTable and a PivotChart. The PivotTable is titled 'Total Department' and shows data for '0000: Net Income' for 'FY14' across 'Jan', 'Feb', and 'Mar'. The PivotChart is a bar chart showing the same data. The PivotTable data is as follows:

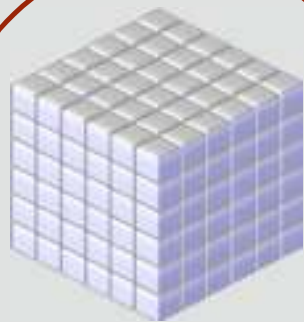
	0000: Net Income	0000: Net Income	0000: Net Income
	FY14	FY14	FY14
	Jan	Feb	Mar
Total Department	5961904	4718269	4361213
No Department	-15458	-18008	-9652
Resources	-242632	-265625	-249828
Other Corporate	-109028	-76020	-102131
Sales	8722644	7033591	8147734
Manufacturing	-1722175	-1283681	-2785861
Other Departments	-51418	-51418	-51418
Finance and Accounting	-418248	-423058	-401748
HR and Administration	-201362	-197112	-185884

Essbase Terminology

ASO Essbase **applications**:
one ASO **cube** to one ASO
Essbase application



ASO Cube

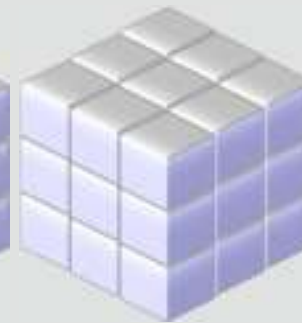


ASO Cube

BSO Essbase **applications**:
One or more Essbase **cubes** to
one BSO Essbase application



BSO Cube



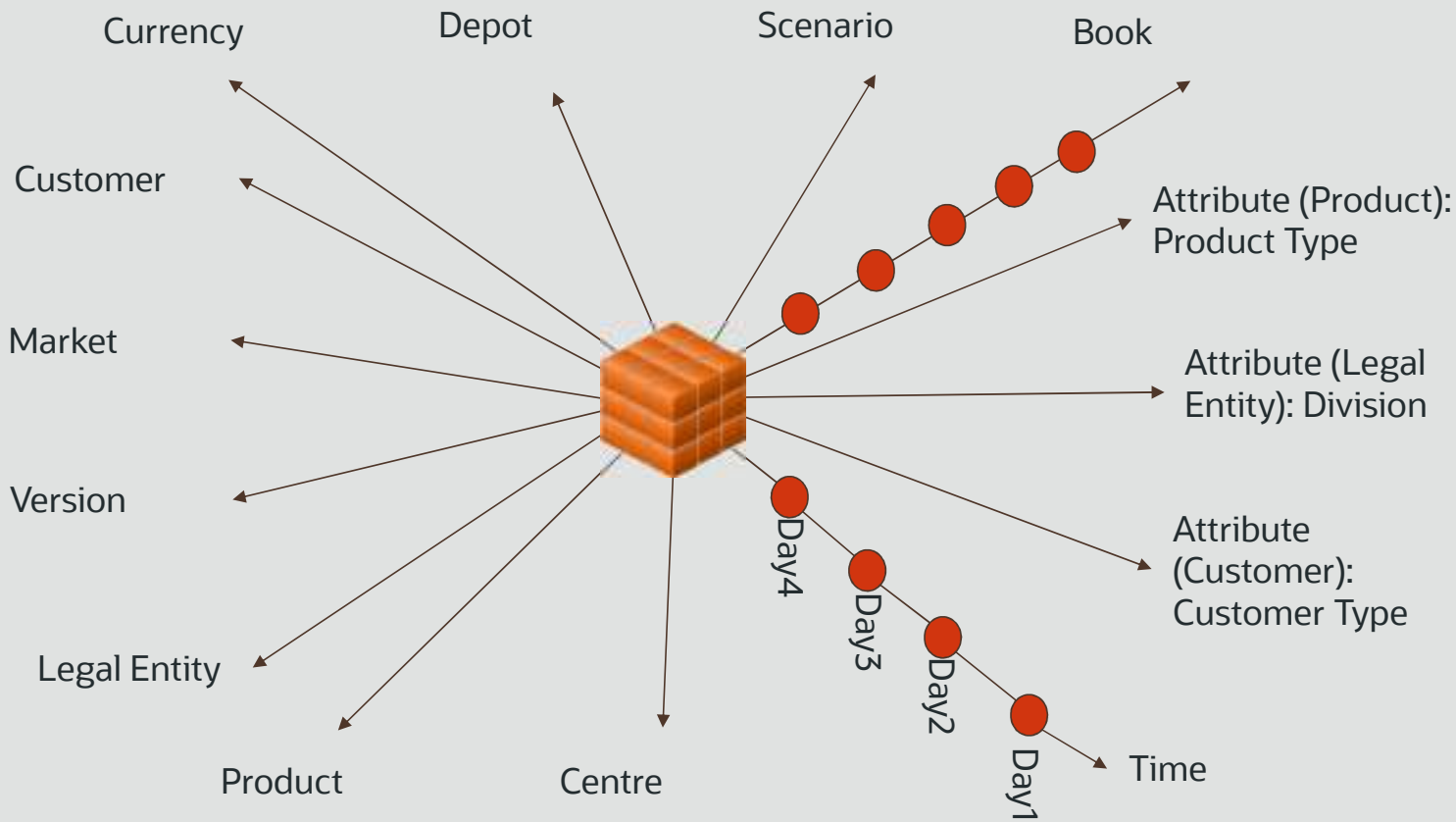
BSO Cube



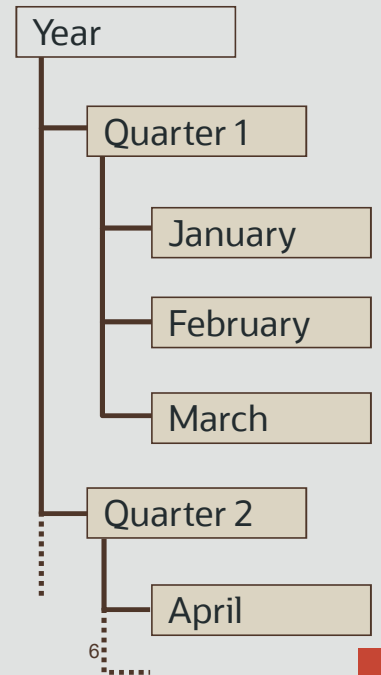
BSO Cube

Dimensions & Members

Hierarchies and structures



Name	Type	Declared Members	Stored Members
Account	Dense	266	206
Period	Dense	25	15
HSP_View	Sparse	4	3
Year	Sparse	10	10
Scenario	Sparse	15	10
Version	Sparse	161	157
Entity	Sparse	126	64
Product	Sparse	26	21





2. What are Dimensions and Members?

The Basics for understanding BSO

What are Dimensions?

The Basics for Understanding BSO

Dimensions for Plan1 (BSO)			
Name	Type	Declared Members	Stored Members
Account	Dense	266	206
Period	Dense	25	15
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Year	Sparse	10	10
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- A dimension is a view-point on the data.
- Members relating to that dimension/view-point are created within the dimension as a hierarchy.
- Members can be stored, dynamic or navigational aids (label only) or shared to create reporting hierarchies.
- Declared members is the total of ALL members in the dimension (+ Dynamic Time Series for Period).
- Stored members does not include dynamic calc, label only or shared members.
- Each standard dimension in a BSO cube is either DENSE or SPARSE.





3. What is a Block?

Dense and Sparse: The Link to Everything BSO



Dense & Sparse

The Link to Everything BSO



Dimensions for Plan1 (BSO)			
Name	Type	Declared Members	Stored Members
Account	Dense	266	206
Period	Dense	25	15
HSP_View	Sparse	4	3
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Entity	Sparse	126	64
Product	Sparse	26	21

- The data storage unit in a BSO cube is a BLOCK.
- DENSE & SPARSE determines how big each block is and how many blocks could exist.
- Each standard dimension in a BSO cube can either be DENSE or SPARSE.
- The decision whether a dimension is DENSE or SPARSE is made at design stage.
- DENSE & SPARSE determines how the data is stored in a BSO cube.
- The size and number of BLOCKS, at a high level, will determine how the BSO cube executes operations (retrieves, calculations, reports etc.) and the performance thereof.

Dense & Sparse

And how it affects the anatomy of a BLOCK



Dimensions for Plan1 (BSO)			
Name	Type	Declared Members	Stored Members
Account	Dense	266	206
Period	Dense	25	15
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Year	Sparse	10	10
Scenario	Sparse	15	10
Version	Sparse	161	157
Entity	Sparse	126	64
Product	Sparse	26	21

- The data storage unit in a BSO cube is a BLOCK.
- The number of *stored members* in the DENSE dimensions determines the SIZE of the block.
- The number of stored SPARSE *combinations* determines the *potential* number of blocks.
- A new block is created every time data is loaded for that SPARSE combination.
- Let's see how that works ...



Dense

Calculating Block size

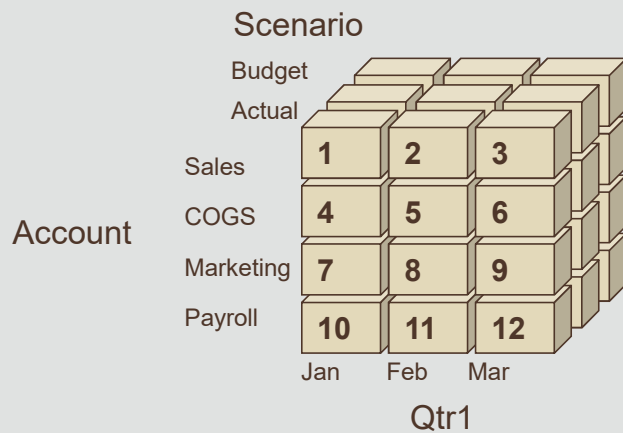
Account	Sales	1	2	3
	COGS	4	5	6
	Marketing	7	8	9
	Payroll	10	11	12
		Jan	Feb	Mar
		Qtr1		

- The number of CELLS in a BLOCK are calculated by multiplying together the STORED members in the DENSE dimensions:
- $3 \text{ Time} * 4 \text{ Accounts} = 12 \text{ cells}$



Dense

Calculating Block size



- The number of CELLS in a BLOCK are calculated by multiplying together the STORED members in the DENSE dimensions:
- $3 \text{ Time} * 4 \text{ Accounts} = 12 \text{ cells}$
- If you add a 3rd dimension, the # cells increases:
- $3 * 4 * 3 \text{ Scenario} = 36 \text{ cells}$

Dense

Calculating Block size



Dimensions for Plan1 (BSO)			
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Product	Sparse	26	21

Essbase BSO Cube Statistics	
	Plan1
Dense	2
Sparse	6
Attribute	0
Block Size in Cells	3,090
Block Size in KB	24

To Calculate Block Size in Bytes, first calculate the number of cells by multiplying the stored member count of all dense dimensions:

- $= 206 * 15 = 3090$ cells

Then multiply by 8 (8 bytes per cell)

- $* 8$ bytes per cell = 24,720 bytes
- $/ 1024$ to calculate KB
- = 24KB

- Optimal block size is 8-200kb



Sparse

And how it affects the number of blocks



Dimensions for Plan1 (BSO)			
Name	Type	Declared Members	Stored Members
Account	Dense	266	206
Period	Dense	25	15
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- Sparse Dimensions determine the potential number of blocks
- A new block is only created:
 - When data is loaded
 - With a sparse calculation
 - With a DataCopy command
 - Use of CreateBlock functions
 - Some member formula
- Blocks are created as a combination of all the sparse dimensions



Sparse

How is the number of blocks determined?



Dimensions for Plan1 (BSO)			
Name	Type	Declared Members	Stored Members
Account	Dense	266	206
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Essbase BSO Cube Statistics	
	Plan1
Level 0 Blocks	2,991
Upper Level Blocks	1,336
Total Blocks	4,327

- The potential number of blocks is determined by the stored sparse combinations i.e.
- Potential number of blocks
$$= 3 * 10 * 10 * 157 * 64 * 21$$
$$= 63,302,400$$
- As you can see, this number gets quite large quite quickly.
- BUT, a new block is ONLY created where data exists so the actual number of blocks is much lower.



4. How is Data Stored in BSO?

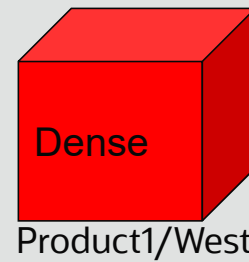
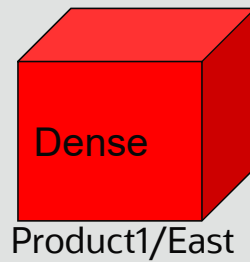
Blocks, blocks, and more blocks!

Sparse

Blocks are created as a combination of Sparse dimensions



1. For example, new blocks are created when data is loaded

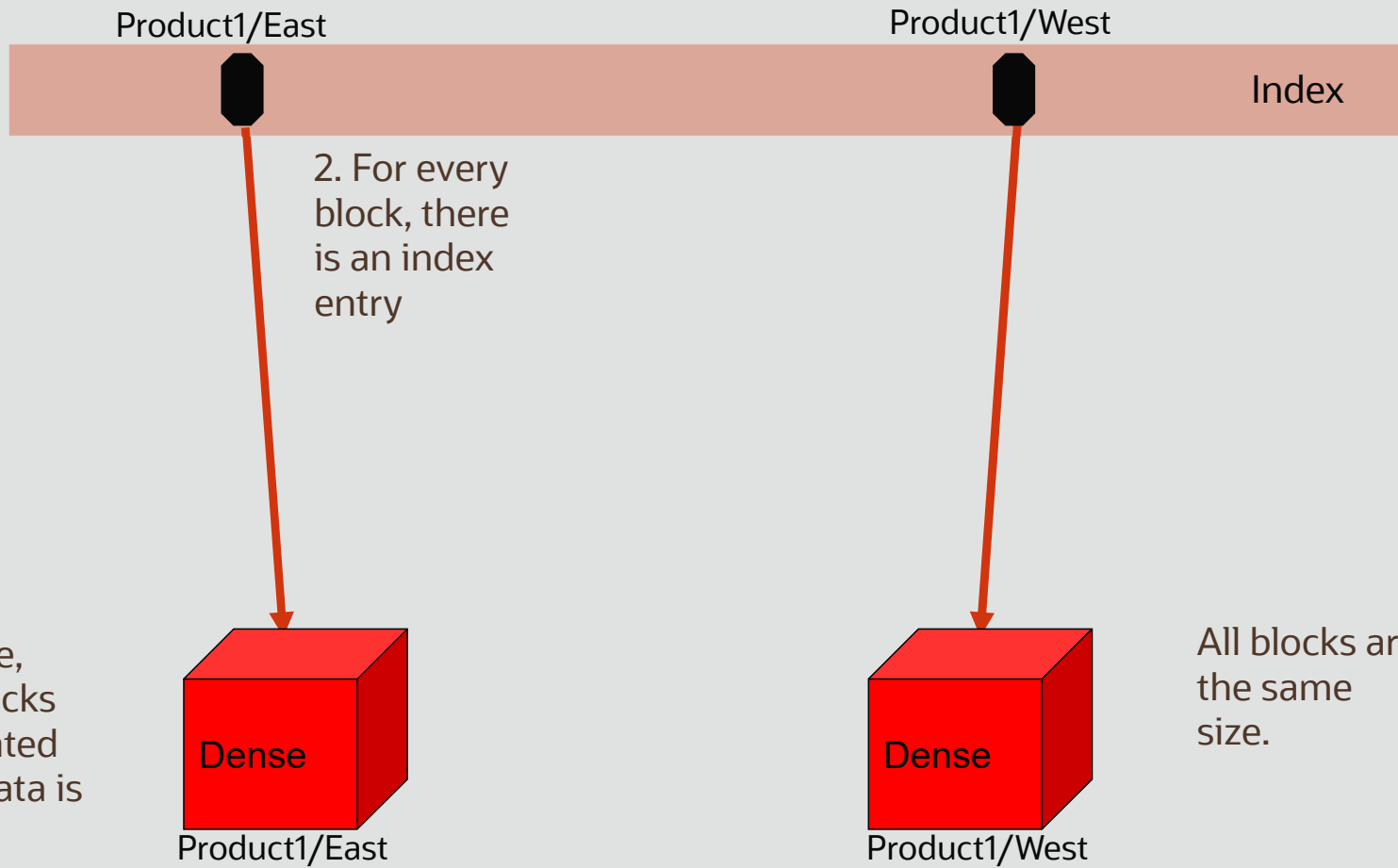


All blocks are the same size.



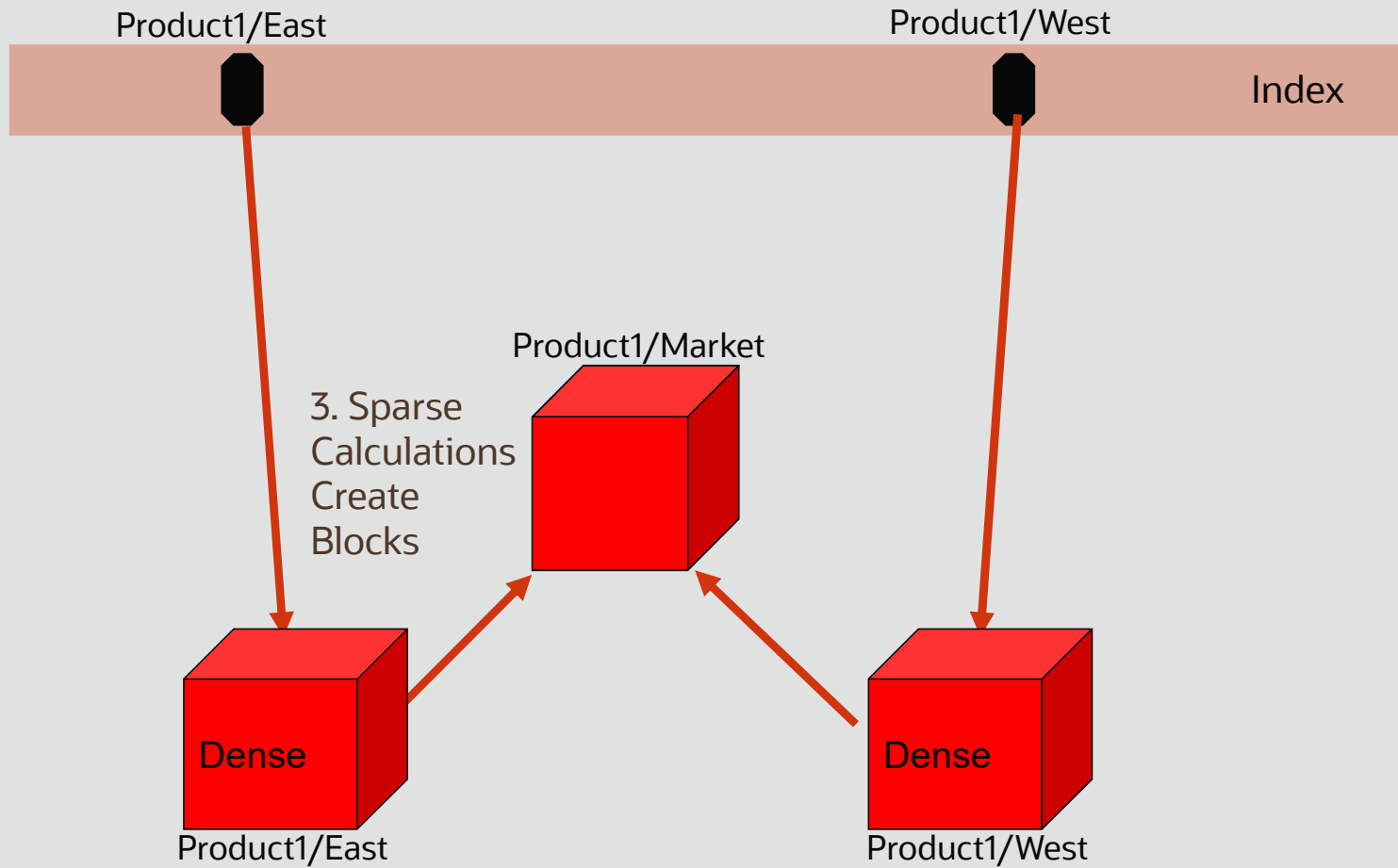
Sparse

Blocks are created as a combination of Sparse dimensions



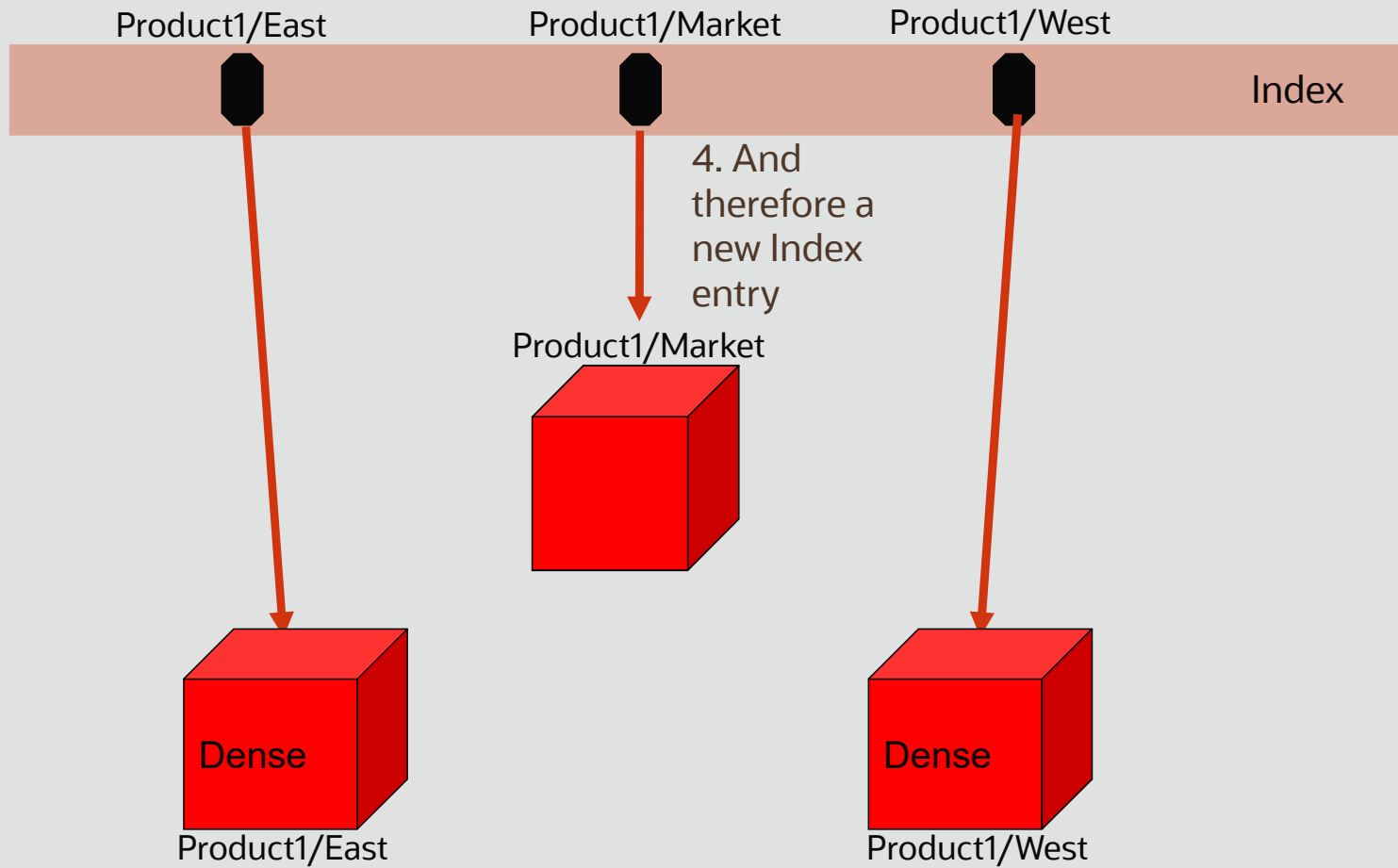
Sparse

Blocks are created as a combination of Sparse dimensions



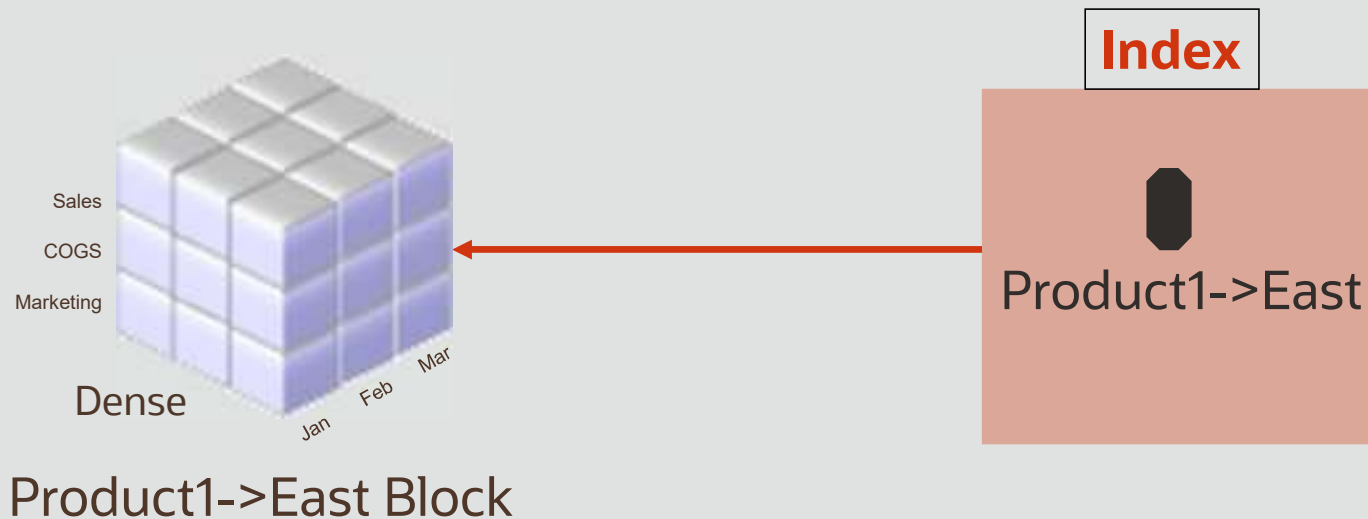
Sparse

Blocks are created as a combination of Sparse dimensions



Dense & Sparse

The Link to Everything Essbase



Every Block containing dense dimension references has an **Index** Point containing sparse dimension references.

Dense & Sparse

The Link to Everything Essbase

- The number of stored members in a dense dimension determines the size of the block.
- The number of stored members in a sparse dimension determines the potential number of blocks, and an index entry is created for each sparse combination.
- The number of each stored member in each dimension is used in these calculations.
- Every block is the same size.
- Dense member data is in EVERY block.
- Sparse member data is only in the blocks for those sparse combinations.



Dimensions for Plan1 (BSO)			
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Dense & Sparse

The Link to Everything Essbase

Dense dimensions determine the size of the block



Sparse dimensions in combination determine the number of blocks



Product1->Actual
->Spain->Version1



Product1->Actual
->Europe->Version1



Product1->Actual
->New York->Version1



Product1->Actual
->USA->Version1

Dense is in every block. All Blocks are the same size!





5. Where is Data Stored in BSO?

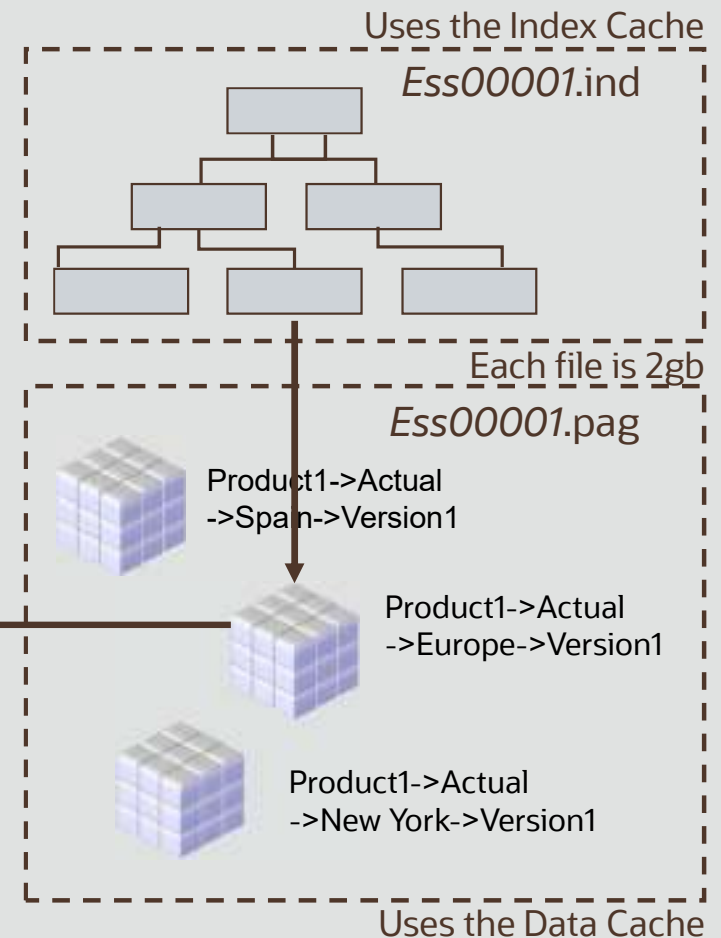
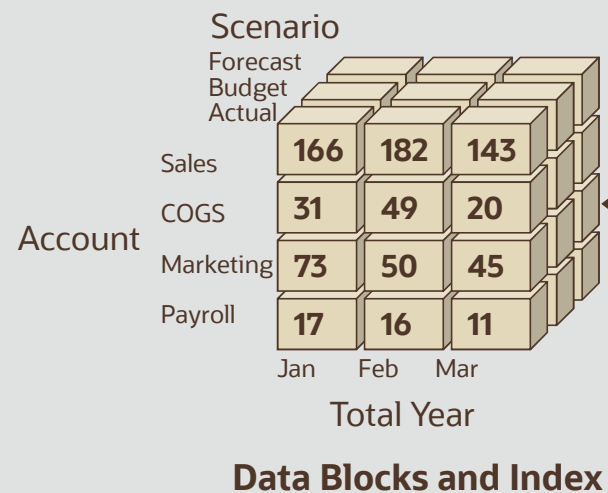
Ind/Pag Files

Where is Data Stored in Essbase BSO?

Ind/Pag files

Dense dimensions define data blocks cell location.

Sparse dimensions define the index, i.e., which block.





6. Types of Blocks

All blocks are the same size but what makes them different?



Sparse

Types of Blocks



Dimensions for Plan1 (BSO)			
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Essbase BSO Cube Statistics	
	Plan1
Level 0 Blocks	2,991
Upper Level Blocks	1,336
Total Blocks	4,327

- A Level 0 block is where ALL the sparse members in the sparse combination are at level0 in its dimension.
- An upper level block is where at least one sparse member is not level 0.
- Input blocks are where data is loaded, whether level0 or upper level.

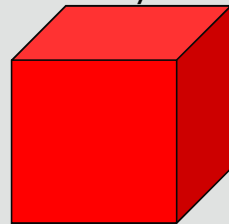
Sparse

Types of Blocks

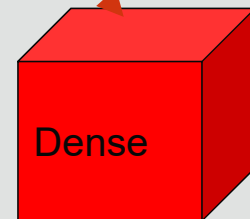


Essbase BSO Cube Statistics	
	Plan1
Level 0 Blocks	2,991
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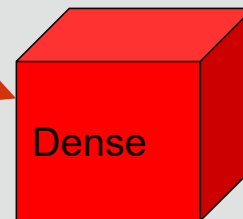
Product1/Market



Essbase BSO Cube Statistics	
	Plan1
Level 0 Blocks	2,991
Upper Level Blocks	1,336
Total Blocks	4,327



Product1/East



Product1/West





7. Where to find BSO information?

Activity Report



Activity Report

BSO cube statistics by cube

Essbase BSO Cube Statistics			
	Plan1	Plan2	Plan3
Total Dimensions	8	7	7
Standard Dimensions	8	7	7
Dense	2	2	2
Sparse	6	5	5
Attribute	0	0	0
Block Size in Cells	3,090	15	15
Block Size in KB	24	0	0
Level 0 Blocks	2,991	0	0
Upper Level Blocks	1,336	0	0
Total Blocks	4,327	0	0
Upper Level Blocks Percentage	31%	0	0
Cells in Million	13	0	0
Block Density	6%	0	0
Average Clustering Ratio	69%	100%	100%
Page File Sizes in MB	7	0	0
Data Cache Setting in MB	500	500	500
Index File Size in MB	7	0	0
Index Cache Setting in MB	50	50	50
Hourglass/Modified Hourglass Deviations on Dense	0	1	1
Hourglass Deviations on Sparse	3	1	1
Modified Hourglass Deviations on Aggregating Sparse	12	7	7

Statistics show:

- No. blocks
- Block size
- Level 0 Blocks
- Upper Level
- Block Density
- Index File Size
- Page File Size

Vision.Plan1	
Actions +	
General	Dimension
Statistics	Transactions
Modifications	
Database start time: 7/5/21	
Database elapsed time: 4 hour 24 minutes 4 second	
Number of connections: 1	
Blocks	
Number of existing blocks: 4327	
Block size(B): 24720	
Potential number of blocks: 178710000	
Existing Level 0 blocks: 2991	
Existing upper level blocks: 1336	
Block Density (%) 6.01	
Percentage of maximum blocks existing: 0.00	
Compression Ratio: 0.00	
Average clustering ratio: 0.69	
Average fragmentation quotient: 0.00	
Run-time	
Index files: 1	
Page files: 1	

Activity Report

Dimensions by Cube

Dimensions for Plan1 (BSO)			
Name	Type	Declared Members	Stored Members
Account	Dense	266	206
Period	Dense	25	15
HSP_View	Sparse	4	3
Year	Sparse	10	10
Scenario	Sparse	15	10
Version	Sparse	161	157
Entity	Sparse	126	64
Product	Sparse	26	21

Vision.Plan1				
Actions				
General Dimension Statistics Transactions Modifications				
Number of dimensions: 8				
Dimension	Type	Members in Dimension	Members Stored	
Account	Dense	266	206	
Period	Dense	25	15	
HSP_View	Sparse	4	3	
Year	Sparse	10	10	
Scenario	Sparse	15	10	
Version	Sparse	161	157	
Entity	Sparse	126	64	
Product	Sparse	26	21	

Dimensions show:

- Number of Standard Dense/Sparse Dimensions
- Number of Attribute Dimensions (if applicable)
- Number of Declared Members
- Number of Stored Members
- Other Member Property Statistics (not shown here)



ORACLE