Business School
UNIVERSITY OF COLORADO DENVER

Information Systems Program

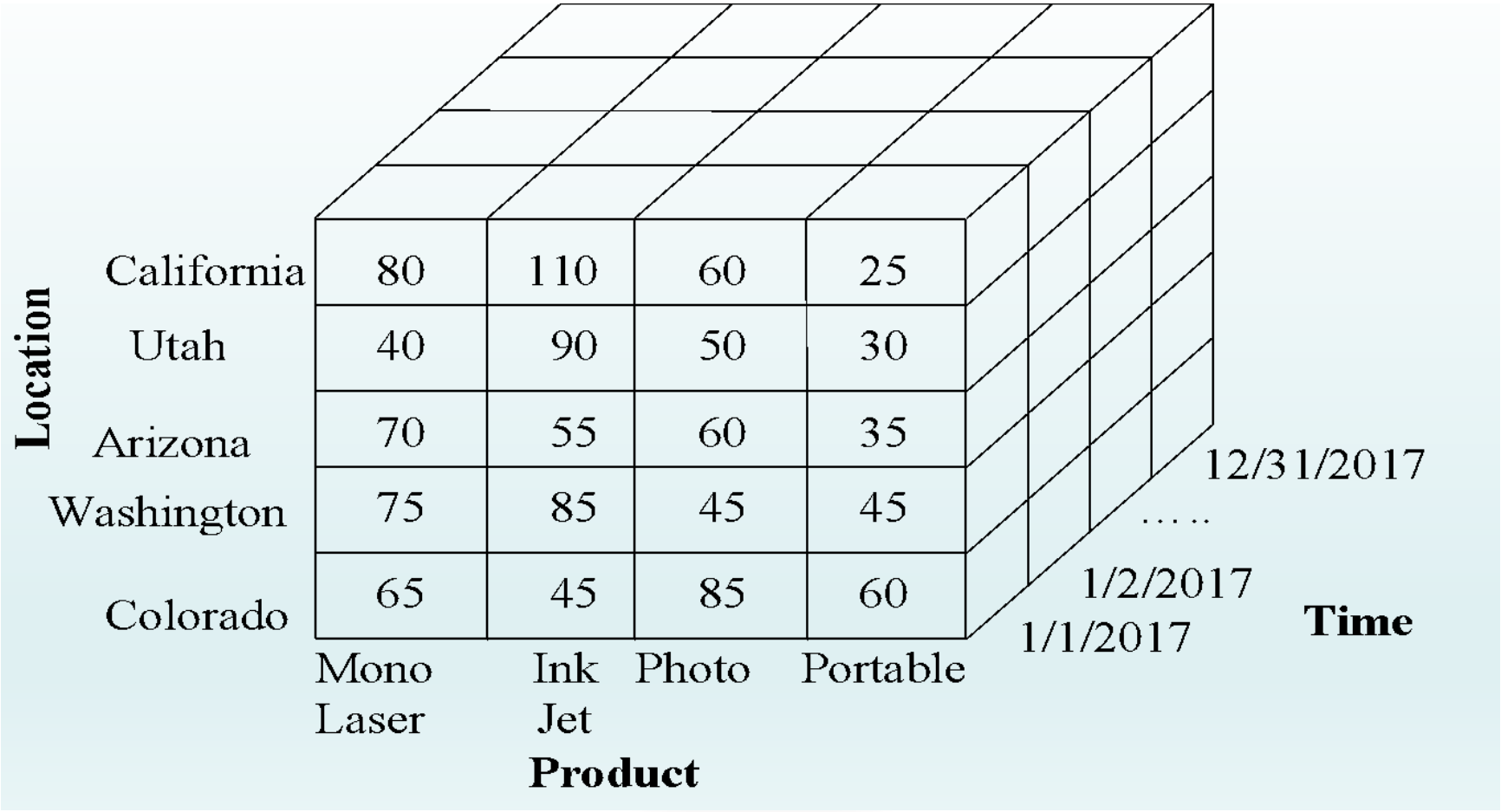
Module 2
Multidimensional data representation and manipulation

Lesson2: Data Cube Operators

Lesson Objectives

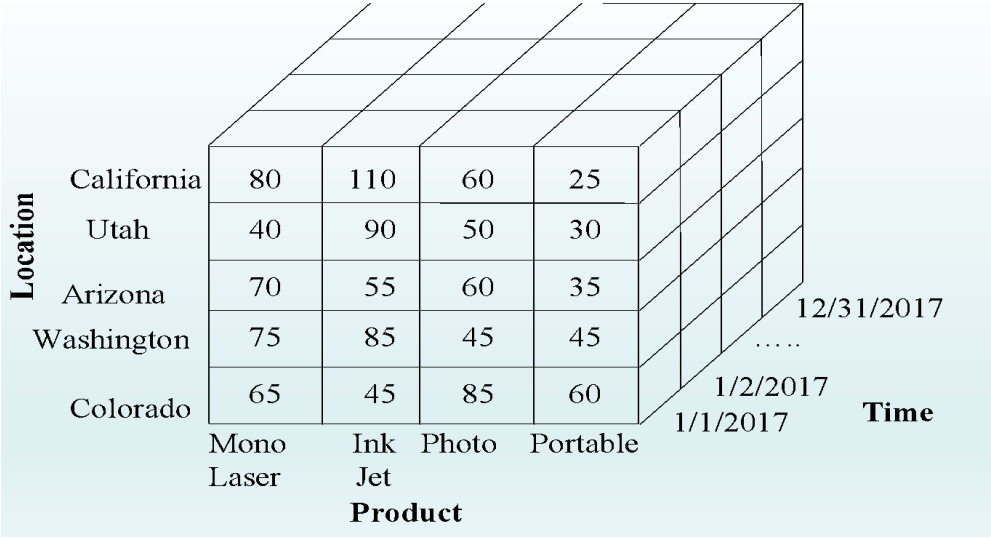
- Explain usage of each operator
- Demonstrate each operator on an example data cube

Sales Data Cube Example



Slice Operator

- Subset of dimensions
- Set dimension to specific value

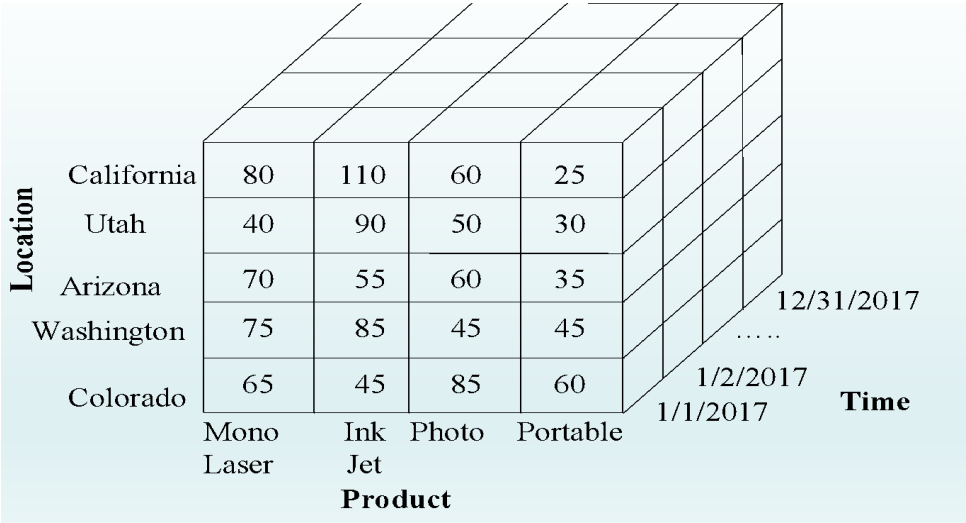


(Location × Product Slice for Time = 1/1/2017)

Location	Product			
	Mono Laser	*Ink Jet*	*Photo*	*Portable*
California	80	110	60	25
Utah	40	90	50	30
Arizona	70	55	60	35
Washington	75	85	45	45
Colorado	65	45	85	60

Slice Summarize Variation

- Replace a dimension with a summary of its values across all members



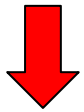
(Location × Time Slice SUM Product Sales)

Location	Time			
	1/1/2017	*1/2/2017*	…	*Total Sales*
California	275	670	…	16,250
Utah	210	190	…	11,107
Arizona	220	255	…	21,500
Washington	250	285	…	20,900
Colorado	255	245	…	21,336

Dice Operator

- Replace a dimension with a subset of values
- Dice operation often follows a slice operation

Location	Product			
	Mono Laser	*Ink Jet*	*Photo*	*Portable*
California	80	110	60	25
Utah	40	90	50	30
Arizona	70	55	60	35
Washington	75	85	45	45
Colorado	65	45	85	60



(Utah, Colorado, Arizona Dice)

Location	Product			
	Mono Laser	*Ink Jet*	*Photo*	*Portable*
Utah	40	90	50	30
Arizona	70	55	60	35
Colorado	65	45	85	60

Navigation Operators

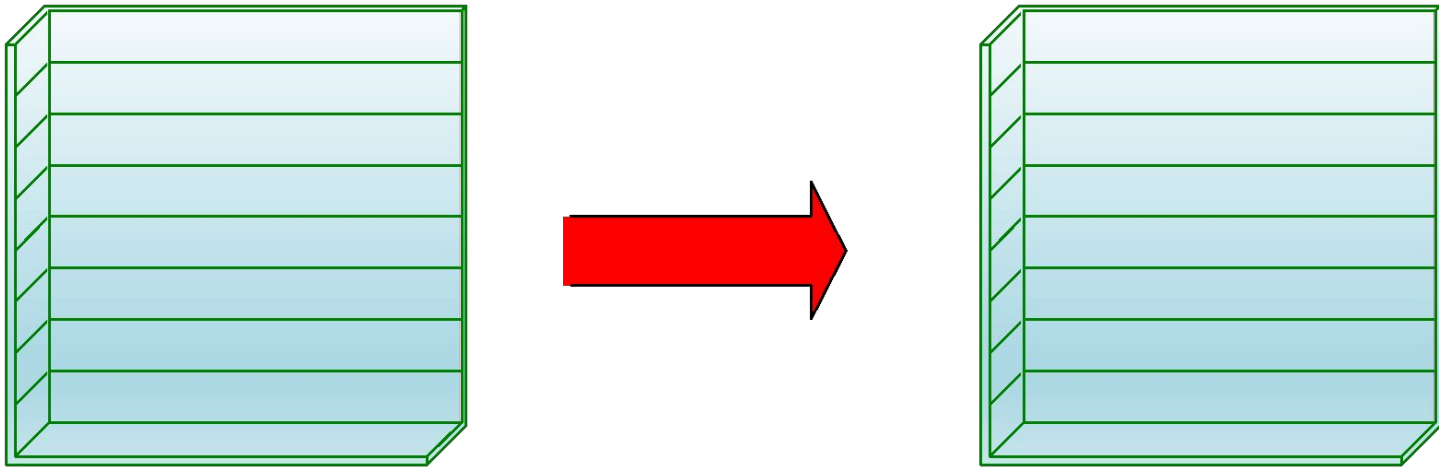
- Operators for hierarchical dimensions
- Drill-down: add detail to a dimension
- Roll-up: remove detail from a dimension
- Distribute or recalculate measure values

Drill-down Example

Location	Product			
	Mono Laser	Ink Jet	Photo	Portable
California	80	110	60	25
- Utah				
Salt Lake	20	20	10	15
Park City	5	30	10	5
Ogden	15	40	30	10
Arizona	70	55	60	35
Washington	75	85	45	45
Colorado	65	45	85	60

Pivot Operator

- Rotate or rearrange dimensions



Operator Summary

Operator	Purpose	Description
Slice	Focus attention on a subset of dimensions	Replace a dimension with a single member value or with a summary of its measure values
Dice	Focus attention on a subset of member values	Replace a dimension with a subset of members
Drill-down	Obtain more detail about a dimension	Navigate from a more general level to a more specific level
Roll-up	Summarize details about a dimension	Navigate from a more specific level to a more general level
Pivot	Present data in a different order	Rearrange the dimensions in a data cube

Summary

- Operators for subsets, hierarchical dimensions, and rearrangement
- Well developed commercial languages and tools for data cube manipulation