OLAP Theory-English version
On-Line Analytical processing (Buisness Intelligence)

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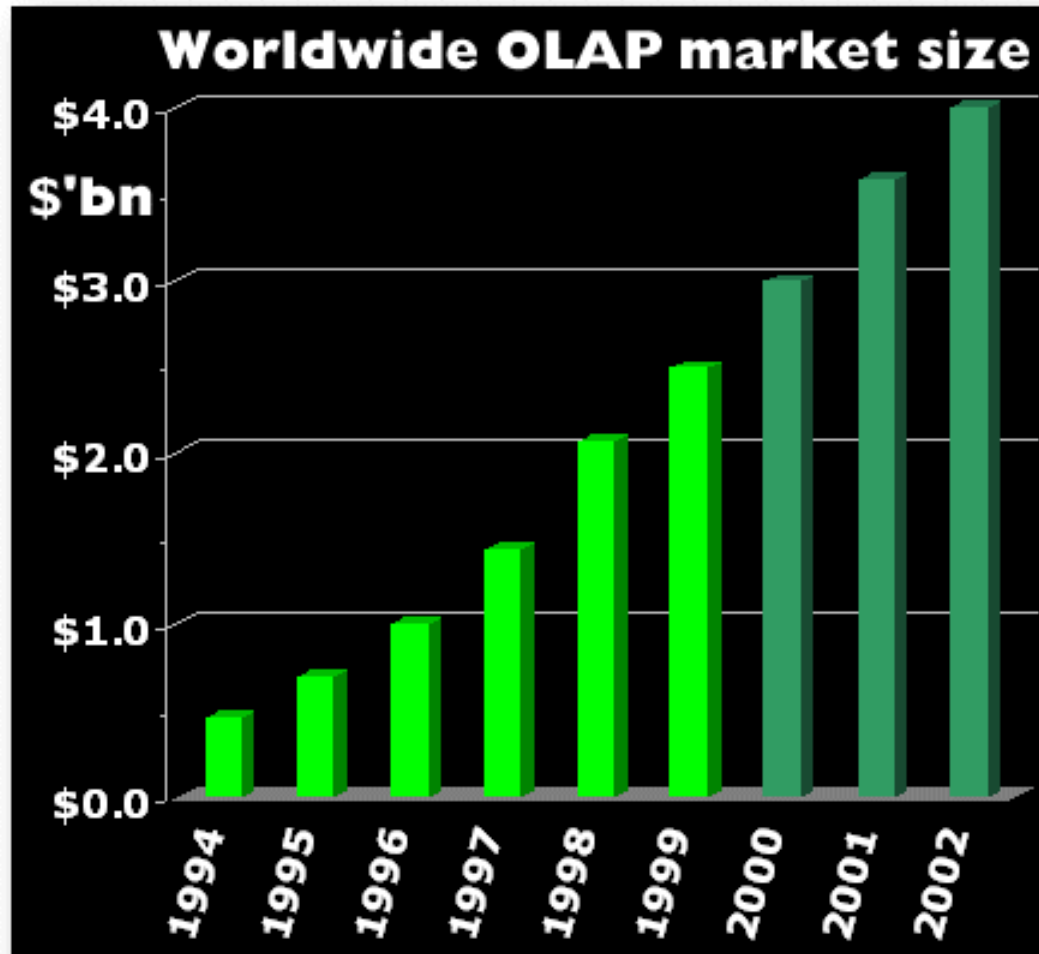Faculty of Economics and Administration

Masaryk Uinverzity Brno

Czech Republic

Agenda

- The Market
- Why OLAP
- Introduction to OLAP
- OLAP Terms and Concepts
- Summary

OLAP market size

Worldwide OLAP market size

A bar chart showing the worldwide OLAP market size in $'bn from 1994 to 2002. The values increase approximately as follows: 1994 ≈ $0.5, 1995 ≈ $0.75, 1996 ≈ $1.0, 1997 ≈ $1.5, 1998 ≈ $2.1, 1999 ≈ $2.5, 2000 ≈ $3.0, 2001 ≈ $3.4, 2002 ≈ $4.0.

Why OLAP

- **The Right Information In The Right Place At The Right Time**
- **Why**
  - More self-sufficient Business users
  - Keep the integrity of the data
  - Reduces the query drag(burden) and network traffic
  - Organization can respond more quickly to market demands

Introduction to OLAP

"OLAP enables analysts, managers, and executives to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information. OLAP transforms raw data so that it reflects the real dimensionality of the enterprise as understood by the user. "
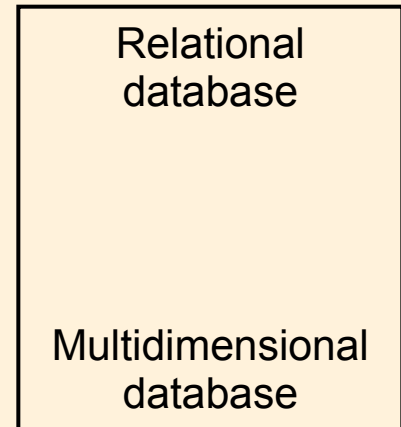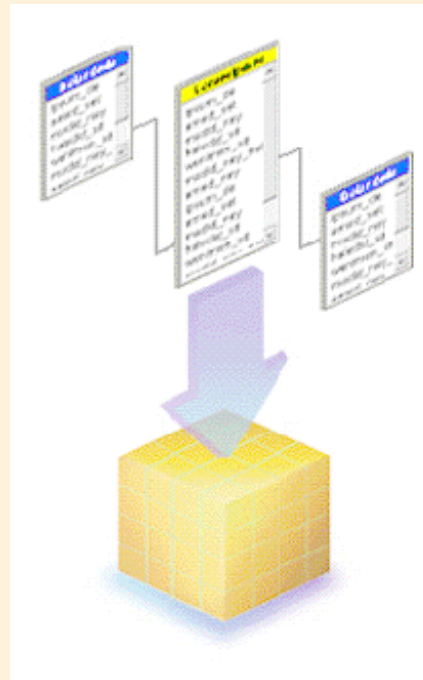
Introduction to OLAP

- Users
  - Analysts, managers and executive managers
- Access
  - Fast consistent, interactive
  - Wide variety of possible views
- Transformation
  - Raw data
  - Real dimensionality of enterprise

Introduction to OLAP

- Organizational functions
  - Finance
    - Budgeting
    - Performance analysis
  - Sales
    - Sales analysis and forecasting
  - Marketing
    - Market research analysis
    - Market/customer segmentation
  - Purchase
    - Cost of materials
  - Production
    - Cost of conversion
  - Distribution
    - Cost of shipping
  - etc

OLAP Terms and Concepts

- Relational database

- Multidimensional database

Relational database
Multidimensional database

For MPH_AOMA not mandatory

Olap statement

- Unlike data warehouses, OLAP cube includes pre-processed data aggregations according to defined hierarchical dimension structures and their combinations.

Dimension Combinations

General

Show Column Name: ☐

Dimension Combinations Matrix

🔍 Find   Filter   🔻 Clear Filter

Code	Name	AREA	BUSINESSGROUP	CUSTOMERGROUP	DEPARTMENT	PROJECT	PURCHASER	SALESCAMPAIGN	SALESPERSON
AREA	Area								
BUSINESSGR...	Business Group			Limited				Limited	
CUSTOMER...	Customer Group		Limited				Blocked		
DEPARTMENT	Department								
PROJECT	Project			Blocked					
PURCHASER	Purchaser								
SALESCAMP...	Sales campaign		Limited						
SALESPERSON	Salesperson								

Dimensions and its values

Code	Name	Code Caption
AREA	Area	Area Code
BUSINESSGR...	Business Group	Businessgroup Code
CUSTOMER...	Customer Group	Customergroup Code
DEPARTMENT	Department	Department C...
PROJECT	Project	Project Code
PURCHASER	Purchaser	Purchaser Cod...
SALESCAMP...	Sales campaign	Salescampaign...
SALESPERSON	Salesperson	Salesperson Ca...

Dimension Values

Type to filter (F3)

Code	Name	Dimension Value Type	Totaling
10	**Europe**	Begin-Total	
20	**Europe North**	Begin-Total	
30	Europe North (EU)	Standard	
40	Europe North (Non EU)	Standard	
45	**Europe North, Total**	End-Total	20..45
50	Europe South	Standard	
55	**Europe, Total**	End-Total	10..55
60	**America**	Begin-Total	
70	America North	Standard	
80	America South	Standard	
85	**America, Total**	End-Total	60..85

Analysis by dimensions

Analysis by Dimensions Matrix ▾

Type to filter (F3)

No

Code	Name	Total Amount	INSTITUTION	INTERCOMP...	LARGE	MEDIUM	PRIVATE	SMALL
10	**Europe**							
20	**Europe North**							
30	Europe North (EU)	-5 925 642,35			-1 284 295,03	-1 501 535,70		-3 139 811,62
40	Europe North (Non EU)	-20 882,66				-11 187,36		-9 695,30
45	**Europe North, Total**	**-5 946 525,01**			**-1 284 295,03**	**-1 512 723,06**		**-3 149 506,92**
50	Europe South	-371 995,41				-11 693,62		-360 301,79
55	**Europe, Total**	**-6 318 520,42**			**-1 284 295,03**	**-1 524 416,68**		**-3 509 808,71**
60	**America**							
70	America North	-299 415,69			-1 499,03	-112 860,88		-185 055,78
80	America South	-212 009,49						-212 009,49
85	**America, Total**	**-511 425,18**			**-1 499,03**	**-112 860,88**		**-397 065,27**

Data pump

Primary Transaction System (ERP,CRM,..)

Data pump

Data warehouse

Data pump *(critical application area)*

Data pump = Extraction Transformation and Loading = ETL

Primary Transaction system ERP,CRM

ETL

Data warehouse

Item entries

Value entries

ETL

G/L entries

Customer Ledger Entries

Částečná změna struktury dat a případně další aplikace dimenzí (oblast, typ zákazníka,..)

Data test correct?)

2006 (1)->2006 (3) časový filtr-dimenze čas

2002 (4)->2007 (2)

IF NOT OK THEN correction feedback=TRUE
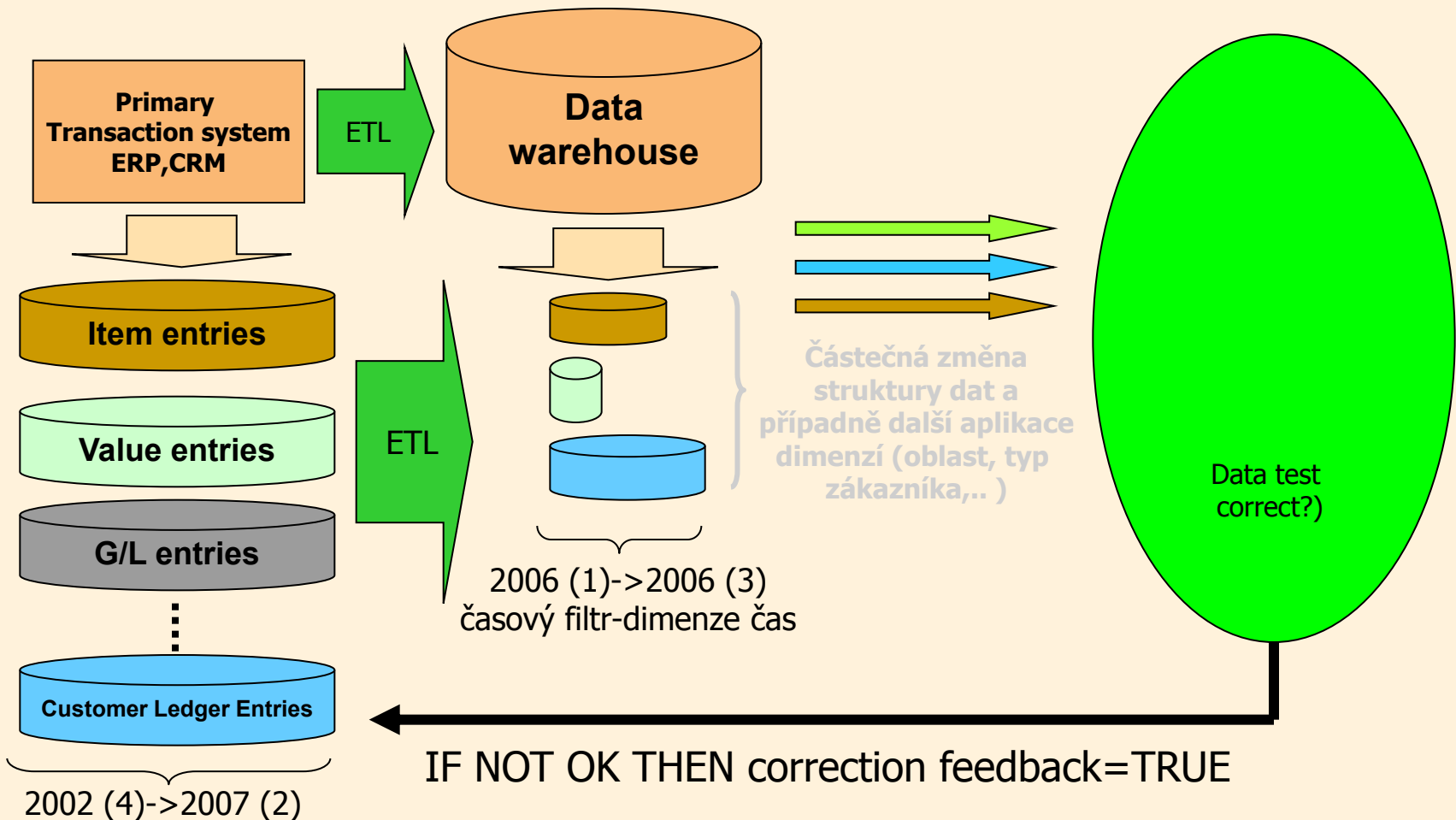
MS Dynamics NAV Relationships

Sales Line Order

Type	No.	Description	Location Code	Quantity	Reserved Quantity	Unit of Measu...	S... P...	Unit Price Excl. VAT	Line Amount Excl. VAT	Line Disco...
Item	LS-MAN-10	Manual for Loudspeakers	WHITE	4		PCS				

Location List

Code	Name
BLUE	Blue Warehouse
GREEN	Green Warehouse
RED	Red Warehouse
SILVER	Silver Warehouse
WHITE	White Warehouse
YELLOW	Yellow Warehouse

Location card

General | Communication | Warehouse | Bins | Bin Policies

Code . . . . WHITE
Name. . . . . White Warehouse
Address . . . . Merrily Grove Avenue 6, 2
Address 2. . . . . . .
Post Code/City . . . . WC1 2GS West End Lane
Country/Region Code . . GB
Contact. . . . .

Bins Tab

General | Communication | Warehouse | Bins | Bin Policies

Receipt
Receipt Bin Code W-08-0001

Bins List

Code	D
W-04-0014	
W-04-0015	
W-05-0001	
W-05-0002	
W-05-0003	
W-05-0004	
W-05-0005	
W-05-0006	

Bin Contents

Location ...	Bin Code	Item No.	Default	Fixed	Quantity	Quantity ...
SILVER	S-02-0001	LS-120	✔	✔	0	0
WHITE	W-02-0001	LS-120		✔	8	8
WHITE	W-02-0002	LS-120		✔	0	0
WHITE	W-05-0002	LS-120			6	6
WHITE	W-05-0005	LS-120		✔	0	0
WHITE	W-05-0006	LS-120		✔	0	0
WHITE	W-09-0001	LS-120			6	6
WHITE	W-09-0002	LS-120			8	8

Item Card

Relations among tables I

The Art Of War – The Big Picture Of WW
(Made by Kamil Sock alias Kree)
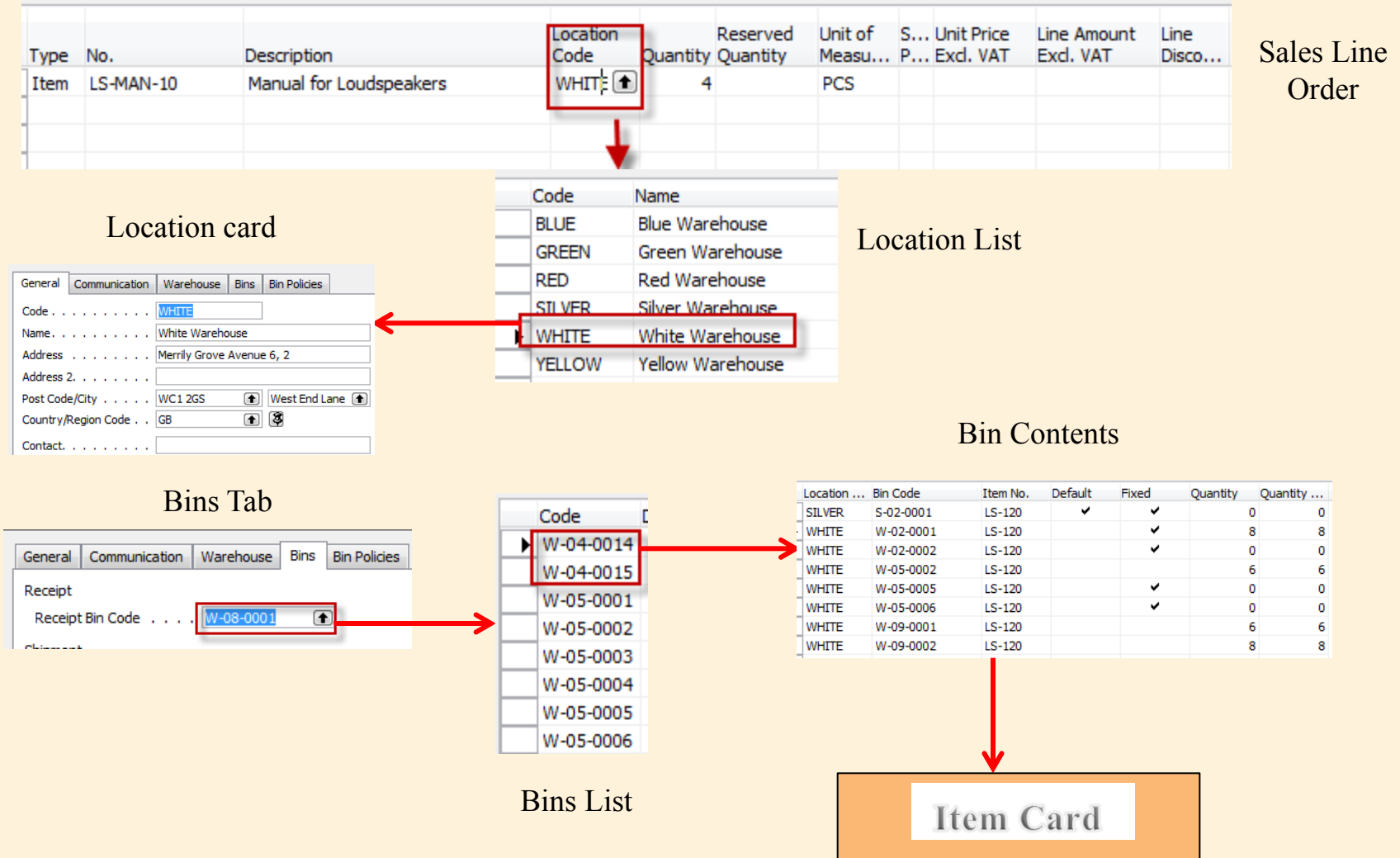
Relations among tables II
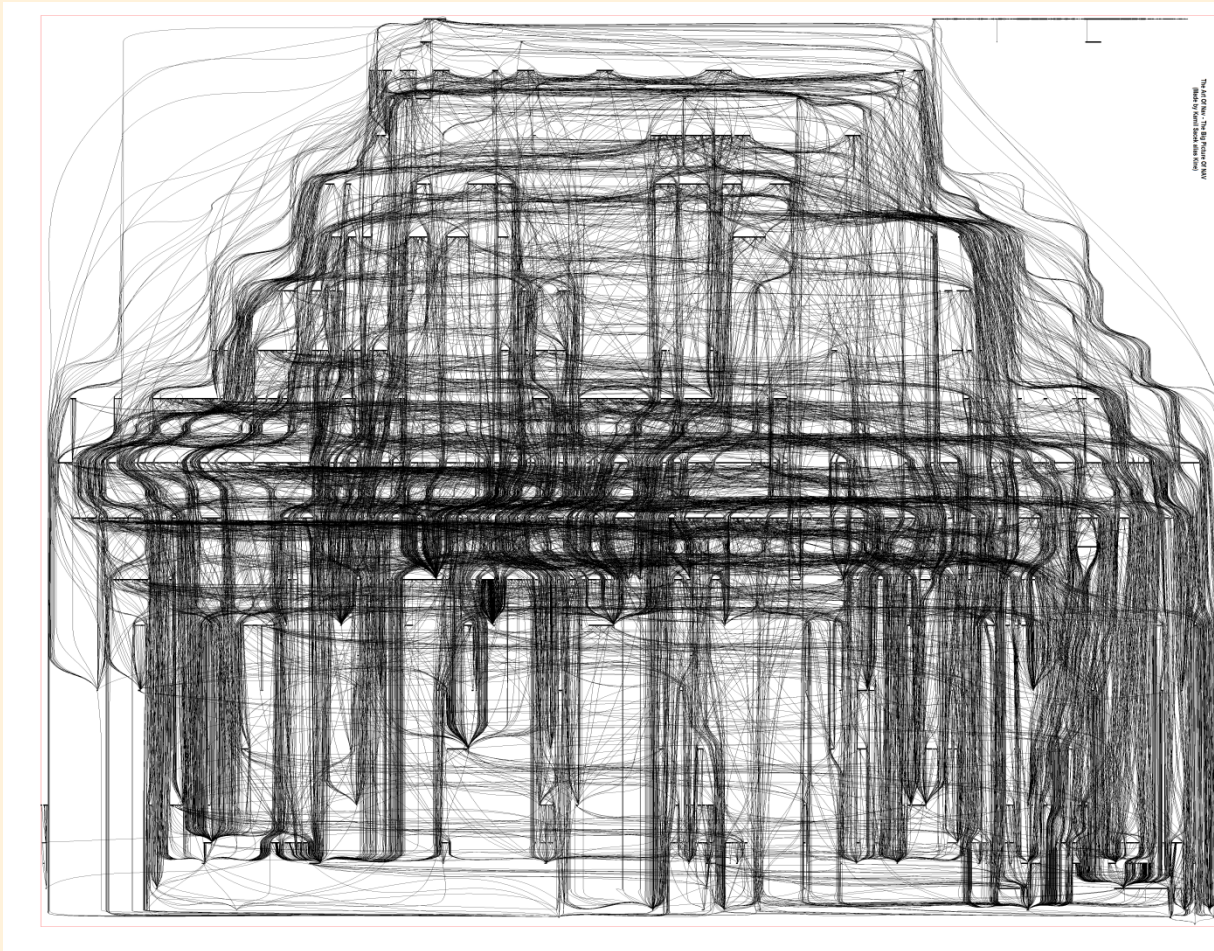
One table and its relations I
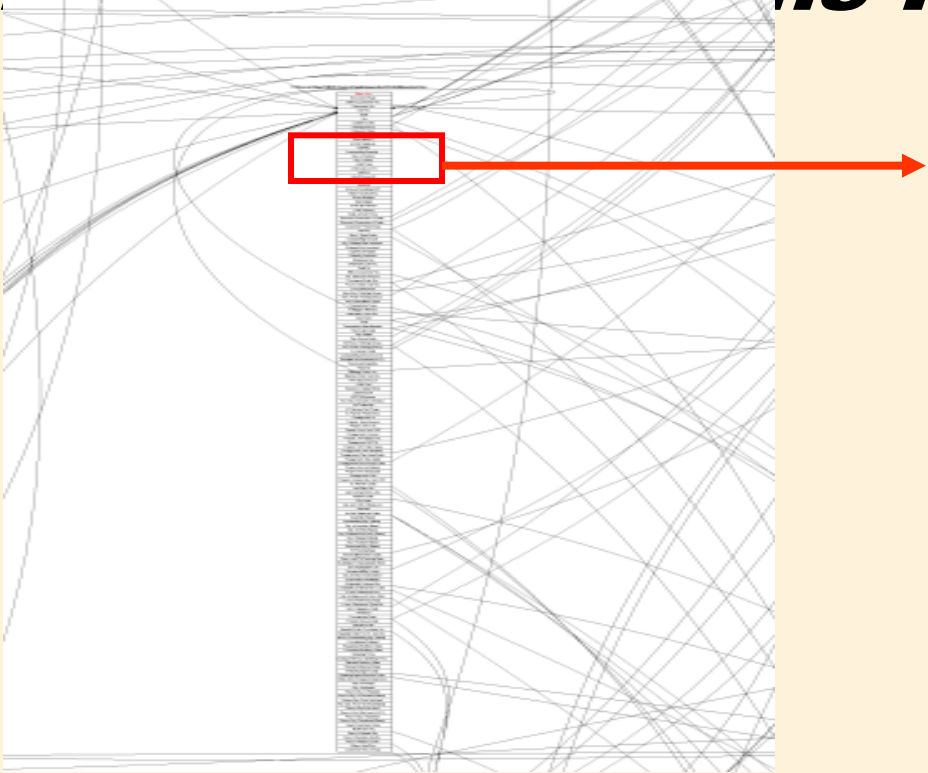
One table (Sales Line) and its re

ERP NAV

MS Dynamics NAV Analysis by Dimensions

| General | Filters | Options |

Date Filter	01.01.11..C31.1...		Area Filter		⬆
G/L Account Filter	6100..6995	⬆	Department Filter		⬆
Business Unit Filter . . .		⬆	Project Filter		⬆
Budget Filter		⬆	Dimension 4 Filter		⬆

	Code	Name	Total Amount	ADM	PROD	SALES
▶	**10**	**Europe**				
	20	**Europe North**				
	30	Europe North (EU)	-5 886 999,97			-5 886 999,97
	40	Europe North (Non EU)	-20 882,66			-20 882,66
	45	**Europe North, Total**	**-5 907 882,63**			**-5 907 882,63**
	50	Europe South	-371 995,41			-371 995,41
	55	**Europe, Total**	**-6 279 878,04**			**-6 279 878,04**
	60	**America**				
	70	America North	-299 415,68			-299 415,68
	80	America South	-212 009,49			-212 009,49
	85	**America, Total**	**-511 425,17**			**-511 425,17**

Will be presented by teacher

OLAP Terms and *Concepts*

N-dimensional Cube

OLAP Terms and Concepts
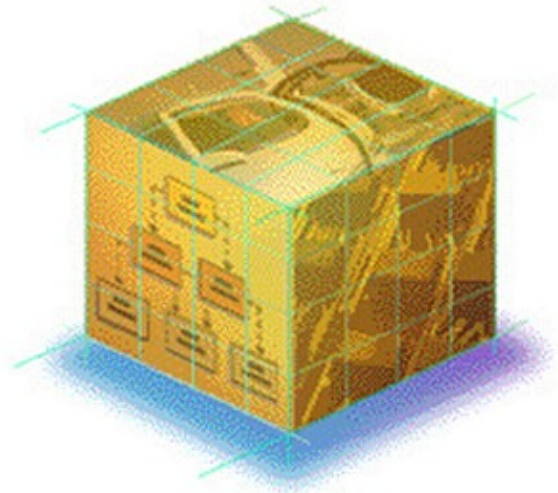
- Cube
    - Information Is conceptually viewed as cubes.

OLAP Terms and Concepts

- Cube
    - Information Is conceptually viewed as cubes.

- Dimension
    - Distinct categories for business data.
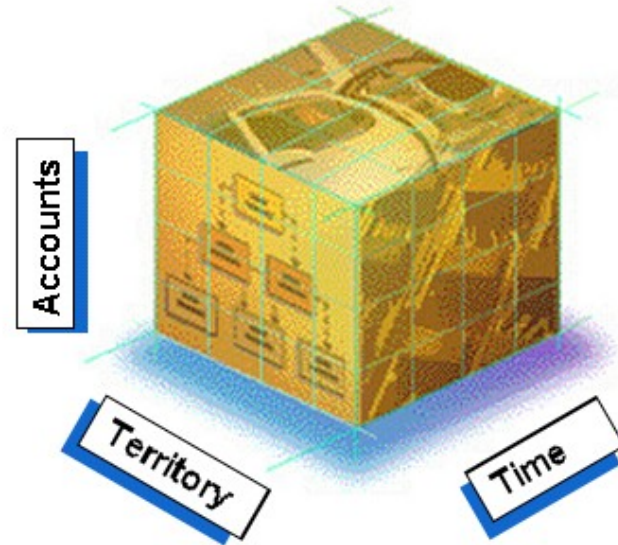
OLAP Terms and Concepts

- Cube
  - Information Is conceptually viewed as cubes.
- Dimension
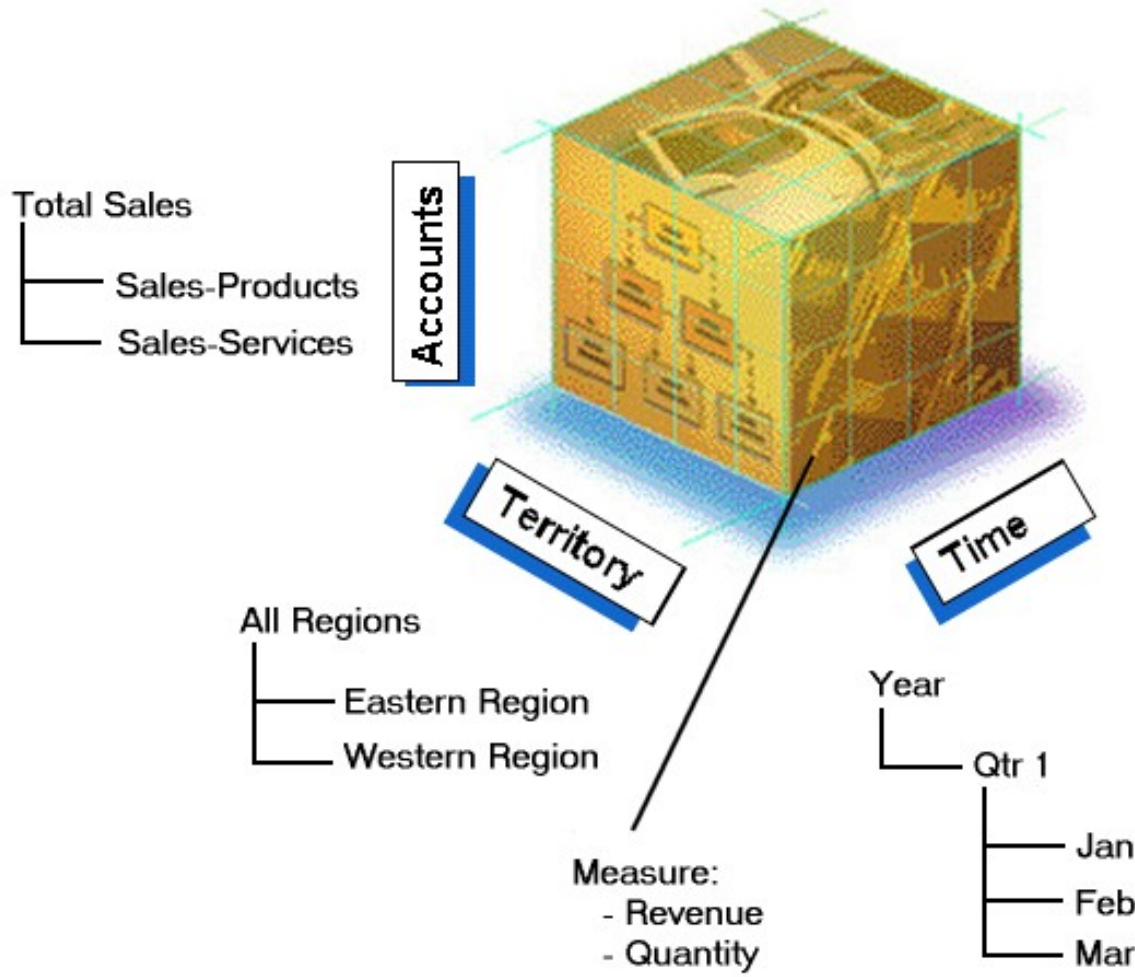 - Distinct categories for business data.
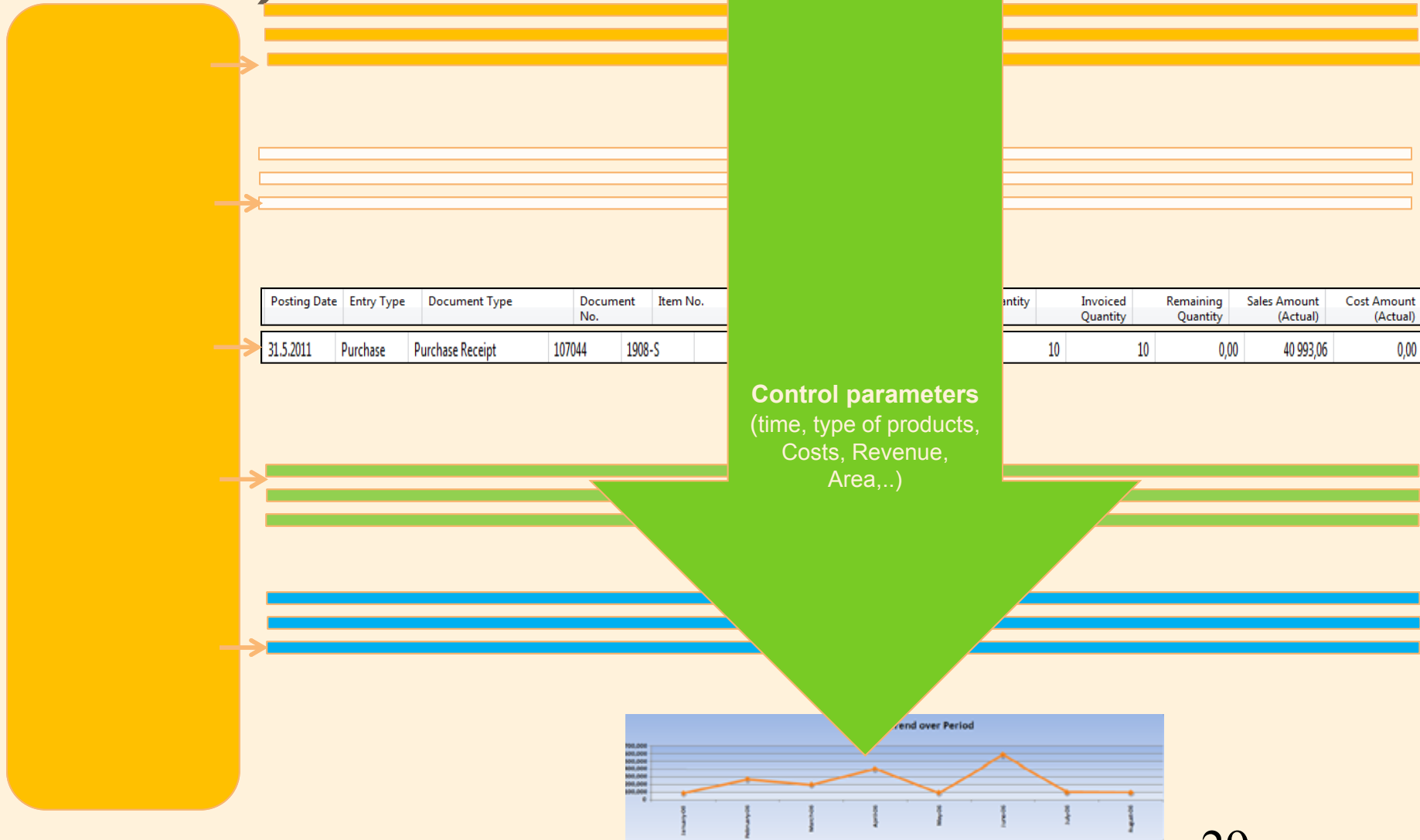- Hierarchy
  - Levels of details on the data.
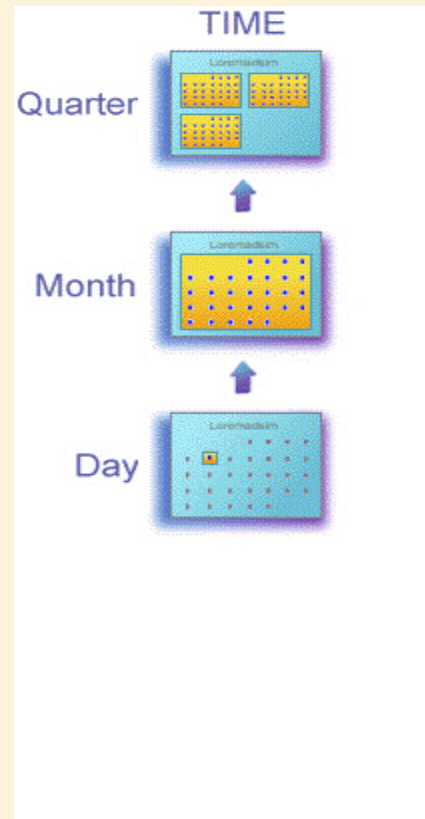
OLAP Terms and Concepts

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  - Distinct categories for business data.
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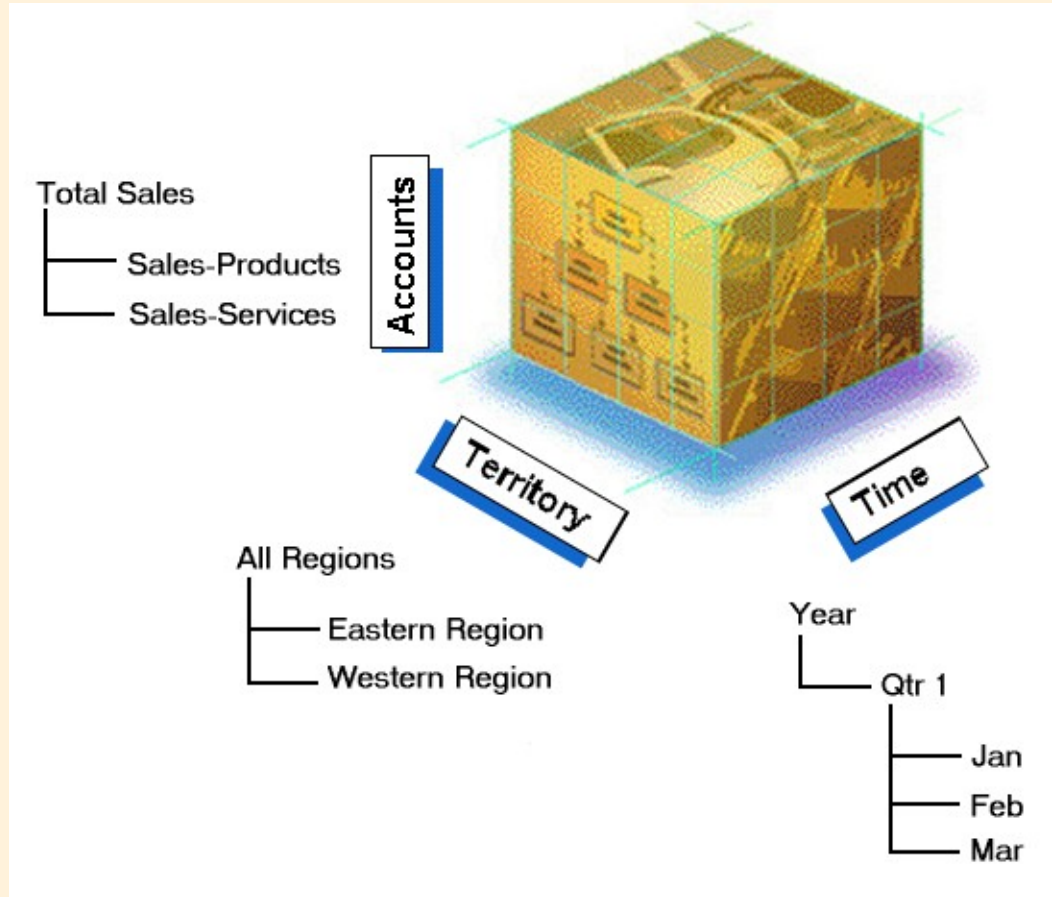
OLAP Terms and Concepts I.

- Cube
  - Information Is conceptually viewed as cubes.
- Dimension
  - Distinct categories for business data.
- Hierarchy
  - Levels of details on the data.
- Measure
  - Quantitative values.
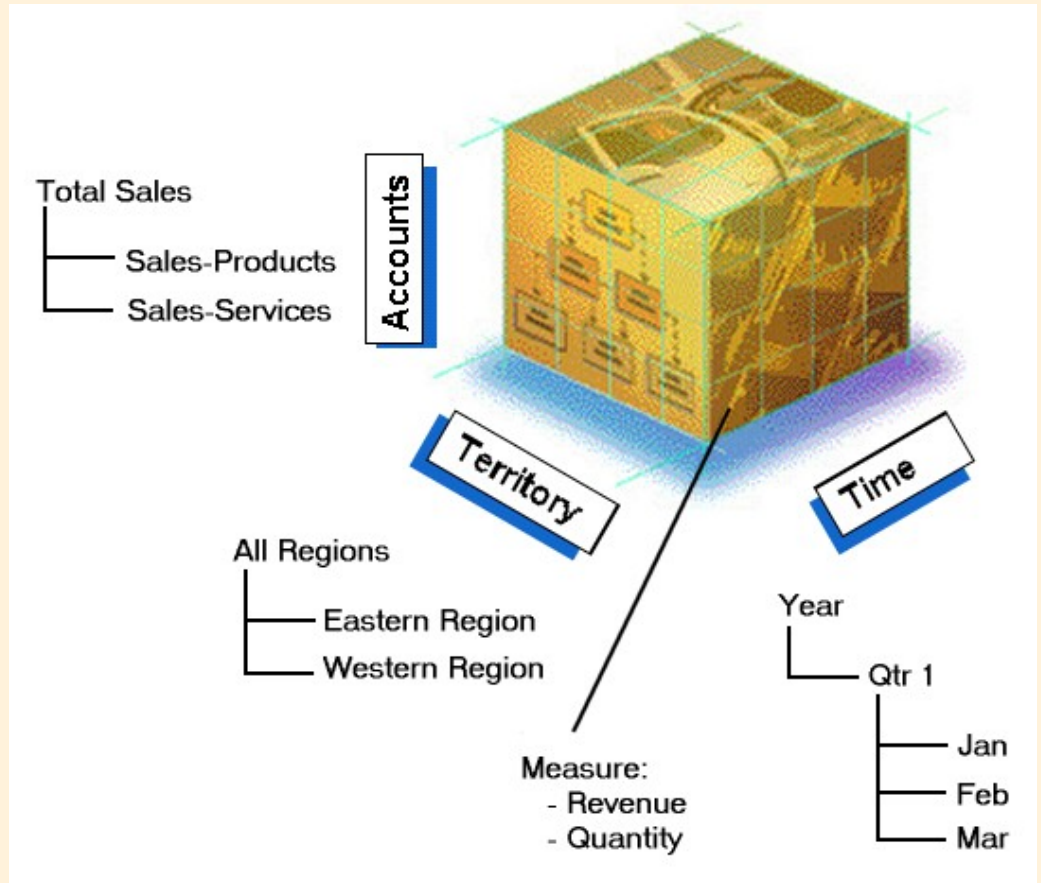
OLAP Terms and Concepts II.

Cube
> Information Is conceptually viewed as cubes.

Dimension
> Distinct categories for business data.

Hierarchy
> Levels of details on the data.

Measure
> Quantitative values.
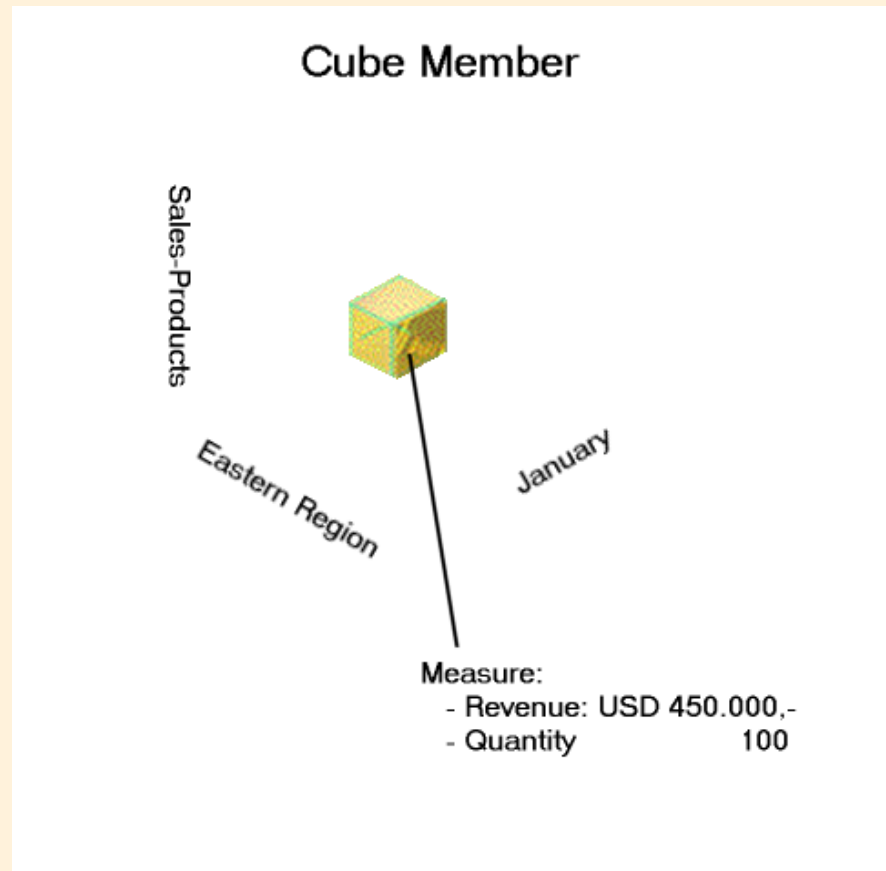
OLAP Cube

Reporting (NAV tools or JETs)

Main principles (source tables and their entries)

Posting Date	Entry Type	Document Type	Document No.	Item No.		antity	Invoiced Quantity	Remaining Quantity	Sales Amount (Actual)	Cost Amount (Actual)
31.5.2011	Purchase	Purchase Receipt	107044	1908-S		10	10	0,00	40 993,06	0,00

Control parameters
(time, type of products, Costs, Revenue, Area,..)

29

Sales analysis NAv 2016w1-part of CRM

Some chosen analysis asked by CFO of company X in Czech Republic

- Working capital – Show of the results from JETs

Working Capital & Current Ratio

Report Date   8/23/2011

2011	January	February	March	April	May	June	July	August	September	October	November	December
Current Assets	74,405	(90,939)	(16,110)	136,096	(92,528)	101,144	(155,777)	174,615	(363,170)	1,015	72,525	(72,789)
Current Liabilities	109,902	(62,118)	(14,989)	127,587	(76,890)	78,566	(193,757)	112,467	(376,168)	2,070	79,494	(65,841)
Working Capital	(35,497)	(28,821)	(1,121)	8,508	(15,638)	22,579	37,980	62,148	12,998	(1,055)	(6,969)	(6,948)
Current Ratio	0.68	1.46	1.07	1.07	1.20	1.29	0.80	1.55	0.97	0.49	0.91	1.11
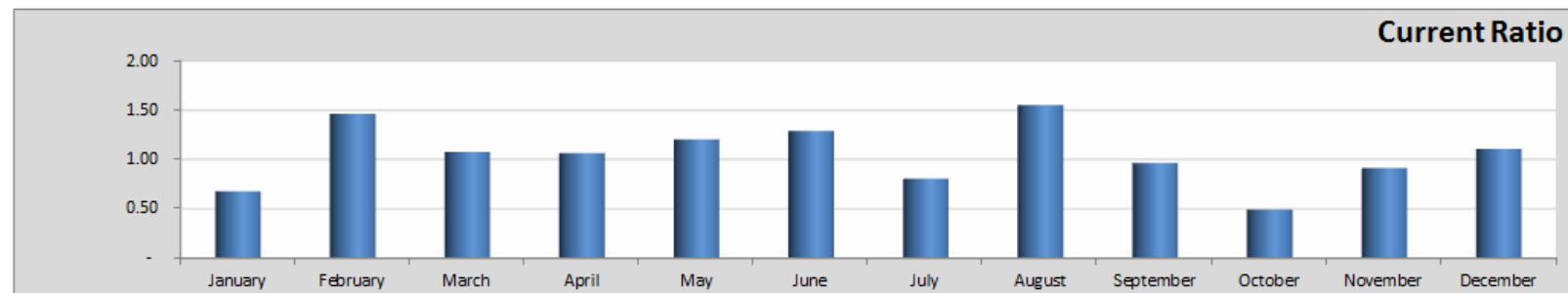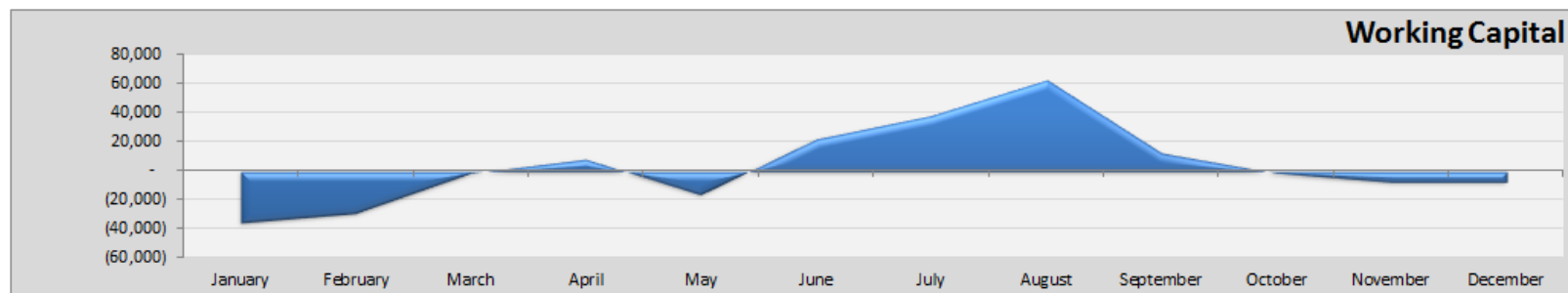
Some chosen analysis asked by CFO of company X in Czech Republic

Inventory - Dashboard

Company	
JetCorp, Belgium	
JetCorp, North America	

Location	
Amsterdam Warehouse 1	
Amsterdam Warehouse 2	

Item Category	
Awards & Recognition	
Bags & Totes	

Product Group	
Flashlights	
USB Drives	

Year	
2007	2008
2009	2010

Quarter	
2010 Q1	2010 Q2
2010 Q3	2010 Q4

Month	
2010 May	2010 Jun
2010 Jul	2010 Aug

Inventory Value (Millions) — stacked area chart by month 2010 Jan–Dec (2010 Q1–Q4)
Legend: Awards & Recognition, Bags & Totes, Caps & Hats, Clocks & Watches, Corporate Gifts, Electronics, Mugs & Drinkware

Current Product Value Mix (pie chart)
30,756 30,551 119,408 94,084 89,453 114,242 297,371
Legend: Awards & Recognition, Bags & Totes, Caps & Hats, Clocks & Watches, Corporate Gifts, Electronics
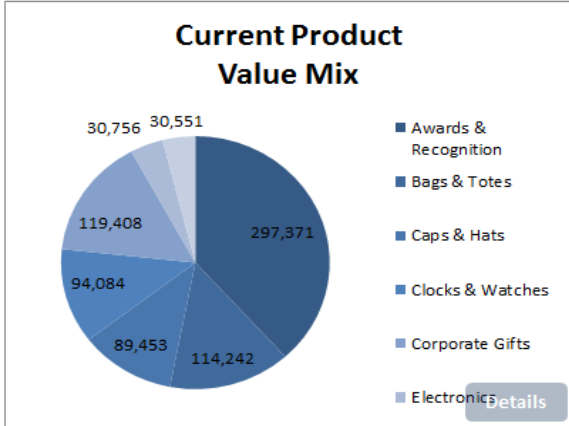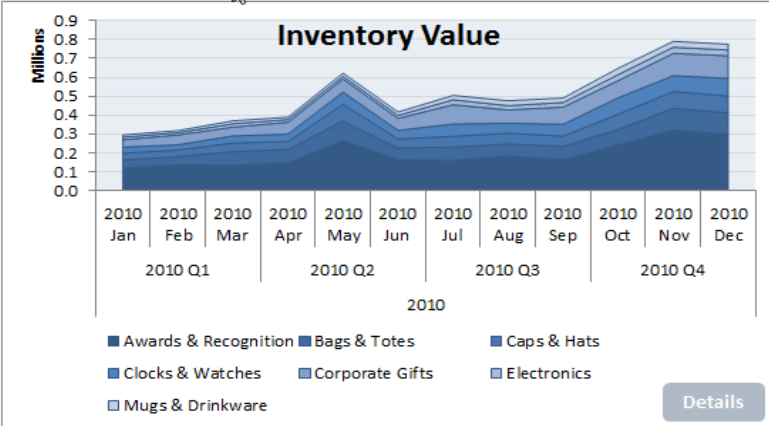
Average Inventory Value	Period	Prev. Yr	Variance	%	Grand Total
⊞ Awards & Recognition	188,840	200,797	-11,957	-5.95%	188,840
⊞ Bags & Totes	72,551	83,459	-10,908	-13.07%	72,551
⊞ Caps & Hats	56,765	63,983	-7,218	-11.28%	56,765
⊞ Clocks & Watches	57,043	63,353	-6,310	-9.96%	57,043
⊞ Corporate Gifts	73,856	81,520	-7,664	-9.40%	73,856
⊞ Electronics	19,293	18,451	842	4.56%	19,293
⊞ Mugs & Drinkware	19,052	16,732	2,320	13.86%	19,052

Value by Category (Thousands, bar chart)
Awards & Recognition 297, Bags & Totes 114, Caps & Hats 89, Clocks & Watches 94, Corporate Gifts 119, Electronics 31, Mugs & Drinkware 31

32
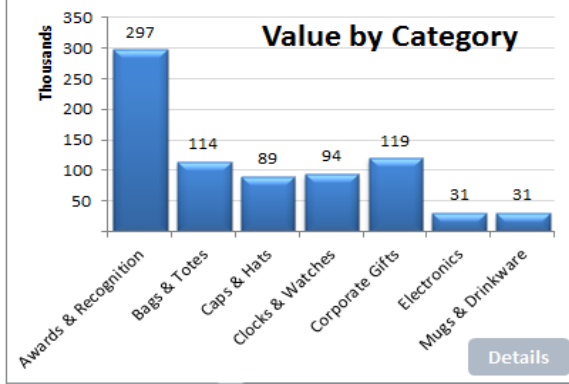
Some chosen analysis examples (JETs)

On-line Transaction Processing and OLAP

	OLTP	OLAP
users	clerk, IT professional	knowledge worker
function	day to day operations	decision support
DB design	application-oriented	subject-oriented
data	current, up-to-date detailed	historical, summarized, multidimensional integrated, consolidated
usage	repetitive	ad-hoc
access	read/write index/hash on primary key	lots of scans
unit of work	short, simple transaction	complex query
# records accessed	tens	millions
#users	thousands	hundreds
DB size	100MB-GB	100GB-TB
metric	transaction throughput	query throughput, response

Terminoly - metadata

- Meta data is the data defining warehouse objects. It has the following kinds
    - Description of the structure of the warehouse (location, dimension, used schema..)
    - The algorithms used for summarization
    - Business data (business terms and definitions, ownership of data)

Business Intelligence Architecture
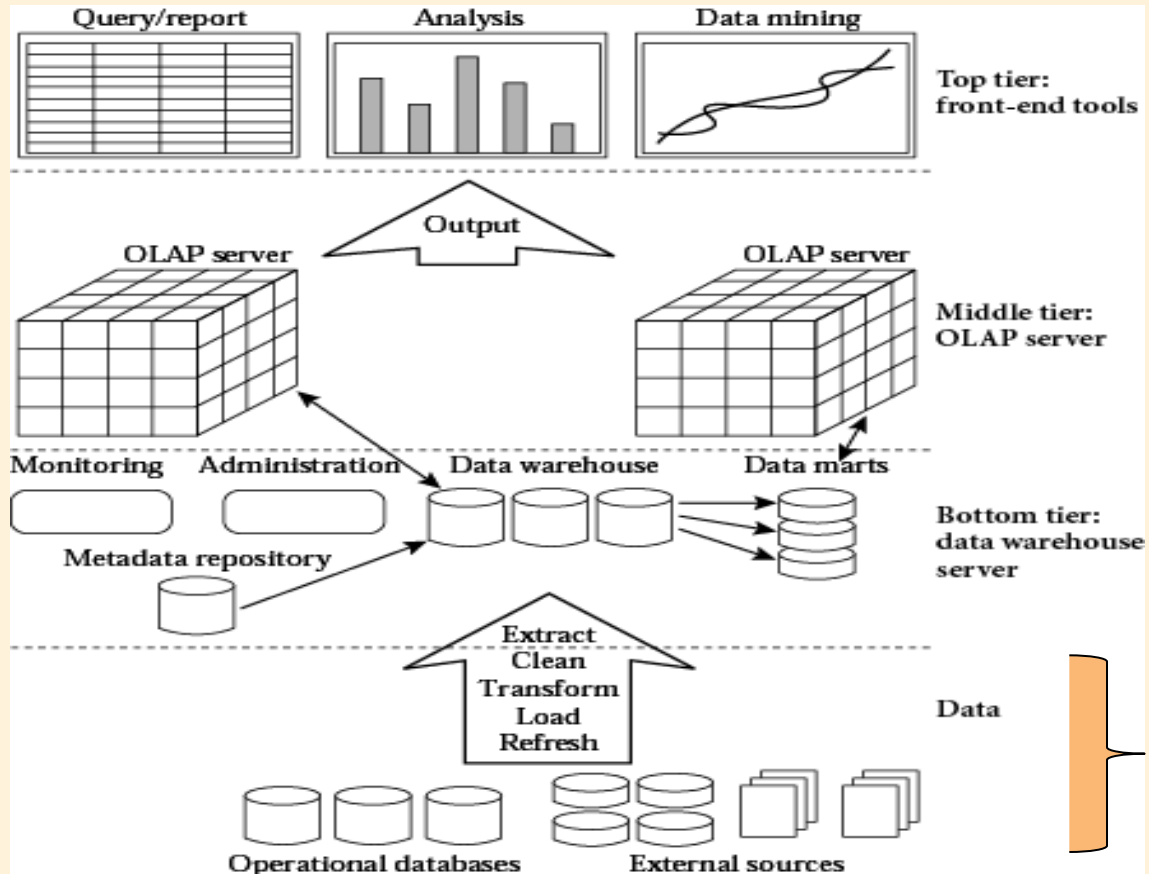
Database➔ Data Warehouse->OLAP server->Reporting