

# Base de données Northwind

## Calcul Relationnel Tuples

- (1)  $\{ e.FirstName, e.LastName, e.Address, e.City, e.Region \mid Employees(e) \}$
- (2)  $\{ e.FirstName, e.LastName, c.CompanyName \mid Employees(e) \wedge Customers(c) \wedge \exists o \exists s Orders(o) \wedge Shippers(s) \wedge e.EmployeeID = o.EmployeeID \wedge o.CustomerID = c.CustomerID \wedge c.City = 'Bruxelles' \wedge o.ShipVia = s.ShipperID \wedge s.CompanyName = 'Speedy Express' \}$
- (3)  $\{ e.Title, e.FirstName, e.LastName \mid Employees(e) \wedge \exists o \exists d \exists p Orders(o) \wedge [Order\ Details](d) \wedge Products(p) \wedge e.EmployeeID = o.EmployeeID \wedge e.EmployeeID = o.EmployeeID \wedge o.OrderID = d.OrderID \wedge d.ProductID = p.ProductID \wedge (p.ProductName = 'Gravad Lax' \vee p.ProductName = 'Mishi Kobe Niku') \}$
- (4)  $\{ e.Title, e.LastName, m.Title, m.LastName \mid Employees(e) \wedge Employees(m) \wedge e.ReportsTo = m.EmployeeID \}$
- (5)  $\{ c.CompanyName, p.ProductName, s.CompanyName \mid Customers(c) \wedge Products(p) \wedge Suppliers(s) \wedge \exists o \exists c Orders(o) \wedge [Order\ Details](d) \wedge c.City = 'London' \wedge c.CustomerID = Orders.CustomerID \wedge o.OrderID = p.OrderID \wedge d.ProductID = p.ProductID \wedge p.SupplierID = s.SupplierID \wedge (s.CompanyName = 'Pavlova, Ltd.' \vee s.CompanyName = 'Karkki Oy') \}$
- (6)  $\{ p.ProductName \mid Products(p) \wedge (\exists e \exists o \exists d Employees(e) \wedge e.City = 'London' \wedge Orders(o) \wedge [Order\ Details](d) \wedge e.EmployeeID = o.EmployeeID \wedge o.OrderID = d.OrderID \wedge d.ProductID = p.ProductID) \vee (\exists c \exists o \exists d Customers(c) \wedge c.City = 'London' \wedge Orders(o) \wedge [Order\ Details](d) \wedge c.CustomerID = o.CustomerID \wedge o.OrderID = d.OrderID \wedge d.ProductID = p.ProductID) \}$
- (7) (a)  $\{ e_1.FirstName, e_1.LastName \mid Employees(e_1) \wedge \exists e_2 Employees(e_2) \wedge e_2.City = 'London' \wedge e_1.BirthDate > e_2.BirthDate \}$   
 (b)  $\{ e_1.FirstName, e_1.LastName \mid Employees(e_1) \wedge \neg(\exists e_2 Employees(e_2) \wedge e_2.City = 'London' \wedge e_1.BirthDate \leq e_2.BirthDate) \}$   
 Autre solution  
 $\{ e_1.FirstName, e_1.LastName \mid Employees(e_1) \wedge (\forall e_2 Employees(e_2) \wedge e_2.City = 'London' \rightarrow e_1.BirthDate > e_2.BirthDate) \}$
- (8)  $\{ e_1.FirstName, e_1.LastName \mid Employees(e_1) \wedge \neg(\exists e_2 Employees(e_2) \wedge e_2.City = 'London' \wedge e_1.HireDate < e_2.HireDate) \}$
- (9)  $\{ e.FirstName, e.LastName, e.City \mid Employees(e) \wedge (\exists o \exists c Orders(o) \wedge Customers(c) \wedge e.EmployeeID = o.EmployeeID \wedge o.CustomerID = c.CustomerID \wedge e.City = c.City) \}$
- (10)  $\{ c.CompanyName \mid Customers(c) \wedge \neg(\exists o Orders(o) \wedge c.CustomerID = o.CustomerID) \}$
- (11)  $\{ c.CompanyName \mid Customers(c) \wedge (\forall p Products(p) \rightarrow \exists o \exists d Orders(o) \wedge [Order\ Details](d) \wedge c.CustomerID = c.CustomerID \wedge o.OrderID = d.OrderID \wedge d.ProductID = p.ProductID) \}$

- (12)  $\{ p.ProductName \mid Products(p) \wedge \forall e Employees(e) \rightarrow$   
 $\exists o \exists d Orders(o) \wedge [Order\ Details](d) \wedge e.EmployeeID = o.EmployeeID \wedge$   
 $o.OrderID = d.OrderID \wedge d.ProductID = p.ProductID \}$
- (13)  $\{ c.CompanyName \mid Customers(c) \wedge ( \forall o_1 \forall d_1 Order(o_1) \wedge$   
 $[Order\ Details](d_1) \wedge o_1.CustomerID = 'LAZYK' \wedge o_1.OrderID = d_1.OrderID \rightarrow$   
 $\exists o_2 \exists d_2 Orders(o_2) \wedge [Order\ Details](d_2) \wedge c.CustomerID = o_2.CustomerID \wedge$   
 $o_2.OrderID = d_2.OrderID \wedge d_1.ProductID = d_2.ProductID ) \}$
- (14)  $\{ c.CompanyName \mid Customers(c) \wedge$   
 $(\forall o_1 \forall d_1 Order(o_1) \wedge [Order\ Details](d_1) \wedge o_1.CustomerID = 'LAZYK' \wedge$   
 $o_1.OrderID = d_1.OrderID \rightarrow \exists o_2 \exists d_2 Orders(o_2) \wedge [Order\ Details](d_2) \wedge$   
 $c.CustomerID = o_2.CustomerID \wedge o_2.OrderID = d_2.OrderID \wedge$   
 $d_1.ProductID = d_2.ProductID)$   
 $\wedge (\forall o_3 \forall d_3 Orders(o_3) \wedge [Order\ Details](d_3) \wedge$   
 $c.CustomerID = o_3.CustomerID \wedge o_3.OrderID = d_3.OrderID \rightarrow$   
 $\exists o_4 \exists d_4 Order(o_4) \wedge [Order\ Details](d_4) \wedge o_4.CustomerID = 'LAZYK' \wedge$   
 $\wedge o_4.OrderID = d_4.OrderID \wedge d_3.ProductID = d_4.ProductID) \}$

Autre version

- $$\{ c.CustomerID, c.CompanyName \mid Customers(c) \wedge$$
- $$\{ d_1.ProductID \mid [Order\ Details](d_1) \wedge \exists o_1 Order(o_1) \wedge$$
- $$o_1.CustomerID = 'LAZYK' \wedge o_1.OrderID = d_1.OrderID \} =$$
- $$\{ d_2.ProductID \mid [Order\ Details](d_2) \wedge \exists o_2 Order(o_2) \wedge$$
- $$c.CustomerID = o_2.CustomerID \wedge o_2.OrderID = d_2.OrderID \} \}$$

# Base de données Northwind

## Calcul Domaines

- (1)  $\{ f, l, a, c, r \mid \text{Employees}(\text{FirstName}: f, \text{LastName}: l, \text{Address}: a, \text{City}: c, \text{Region}: r) \}$
- (2)  $\{ f, l, n \mid \exists e \exists o \exists c \exists s \text{Employees}(\text{EmployeeID}: e, \text{FirstName}: f, \text{LastName}: l) \wedge$   
 $\text{Orders}(\text{OrderID}: o, \text{EmployeeID}: e, \text{CustomerID}: c, \text{ShipVia}: s) \wedge$   
 $\text{Customers}(\text{CustomerID}: c, \text{CompanyName}: n, \text{City}: \text{'Bruxelles'}) \wedge$   
 $\text{Shippers}(\text{ShipperID}: s, \text{CompanyName}: \text{'Speedy Express'}) \}$
- (3)  $\{ t, f, l \mid \exists e \exists o \exists p \text{Employees}(\text{EmployeeID}: e, \text{Title}: t, \text{FirstName}: f, \text{LastName}: l) \wedge$   
 $\text{Orders}(\text{OrderID}: o, \text{EmployeeID}: e) \wedge$   
 $[\text{Order Details}](\text{OrderID}: o, \text{ProductID}: p) \wedge$   
 $( \text{Products}(\text{ProductID}: p, \text{ProductName}: \text{'Gravad Lax'}) \vee$   
 $\text{Products}(\text{ProductID}: p, \text{ProductName}: \text{'Mishi Kobe Niku'}) ) \}$
- (4)  $\{ t, l, ts, ls \mid \exists s \text{Employees}(\text{Title}: t, \text{LastName}: l, \text{ReportsTo}: s) \wedge$   
 $\text{Employees}(\text{EmployeeID}: s, \text{Title}: ts, \text{LastName}: ls) \}$
- (5)  $\{ cn, pn, sn \mid \exists c \exists o \exists p \exists s \text{Customers}(\text{CustomerID}: c, \text{CompanyName}: cn, \text{City}: \text{'London'}) \wedge$   
 $\text{Orders}(\text{OrderID}: o, \text{CustomerID}: c) \wedge$   
 $[\text{Order Details}](\text{OrderID}: o, \text{ProductID}: p) \wedge$   
 $\text{Products}(\text{ProductID}: p, \text{ProductName}: pn, \text{SupplierID}: s) \wedge$   
 $\text{Suppliers}(\text{SupplierID}: s, \text{CompanyName}: sn) \wedge$   
 $(sn = \text{'Pavlova, Ltd.}' \vee sn = \text{'Karkki Oy'}) \}$
- (6)  $\{ n \mid \text{Products}(\text{ProductID}: p, \text{ProductName}: n) \wedge$   
 $(\exists e \exists o \text{Employees}(\text{EmployeeID}: e, \text{City} = \text{'London'}) \wedge$   
 $\text{Orders}(\text{OrderID}: o, \text{EmployeeID}: e) \wedge$   
 $[\text{Order Details}](\text{OrderID}: o, \text{ProductID}: p) )$   
 $\vee$   
 $(\exists c \exists o \text{Customers}(\text{CustomerID}: c, \text{City} = \text{'London'}) \wedge$   
 $\text{Orders}(\text{OrderID}: o, \text{CustomerID}: c) \wedge$   
 $[\text{Order Details}](\text{OrderID}: o, \text{ProductID}: p) ) \}$
- (7) (a)  $\{ f, l \mid \exists b_1 \exists b_2 \text{Employees}(\text{FirstName}: f, \text{LastName}: l, \text{BirthDate}: b_1) \wedge$   
 $\text{Employees}(\text{City}: \text{'London'}, \text{BirthDate}: b_2) \wedge b_1 > b_2 \}$   
 (b)  $\{ f, l \mid \exists d_1 \text{Employees}(\text{FirstName}: f, \text{LastName}: l, \text{BirthDate}: d_1) \wedge$   
 $( \forall d_2 \text{Employees}(\text{City}: \text{'London'}, \text{BirthDate}: d_2) \rightarrow d_1 > d_2 ) \}$
- (8)  $\{ f, l \mid \exists d_1 \text{Employees}(\text{FirstName}: f, \text{LastName}: l, \text{HireDate}: d_1) \wedge$   
 $( \forall d_2 \text{Employees}(\text{City}: \text{'London'}, \text{HireDate}: d_2) \rightarrow d_1 > d_2 ) \}$
- (9)  $\{ f, l, ct \mid \exists e \exists c \text{Employees}(\text{EmployeeID}: e, \text{FirstName}: f, \text{LastName}: l, \text{City}: ct) \wedge$   
 $\text{Orders}(\text{EmployeeID}: e, \text{CustomerID}: c) \wedge \text{Customers}(\text{CustomerID}: c, \text{City}: ct) \}$
- (10)  $\{ n \mid \exists c \text{Customers}(\text{CustomerID}: c, \text{CompanyName}: n) \wedge \neg \text{Orders}(\text{CustomerID}: c) \}$
- (11)  $\{ n \mid \exists c \text{Customers}(\text{CustomerID}: c, \text{CompanyName}: n) \wedge$   
 $( \forall p \text{Products}(\text{ProductID}: p) \rightarrow \exists o \text{Orders}(\text{OrderID}: o, \text{CustomerID}: c) \wedge$   
 $[\text{Order Details}](\text{OrderID}: o, \text{ProductID}: p) ) \}$
- (12)  $\{ n \mid \exists p \text{Products}(\text{ProductID}: p, \text{ProductName}: n) \wedge$   
 $( \forall e \text{Employees}(\text{EmployeeID}: e) \rightarrow \exists o \text{Orders}(\text{OrderID}: o, \text{EmployeeID}: e) \wedge$   
 $[\text{Order Details}](\text{OrderID}: o, \text{ProductID}: p) ) \}$

- (13)  $\{ n \mid \exists c \text{ Customers}(\text{CustomerID}:c, \text{CompanyName}:n) \wedge$   
 $( \forall o_1 \forall p_1 \text{ Order}(\text{OrderID}:o_1, \text{CustomerID}:'\text{LAZYK}') \wedge$   
 $[\text{Order Details}](\text{OrderID}:o_1, \text{ProductID}:p_1) \rightarrow$   
 $\exists o_2 \text{ Orders}(\text{OrderID}:o_2, \text{CustomerID}:c) \wedge$   
 $[\text{Order Details}](\text{OrderID}:o_2, \text{ProductID}:p_1) ) \}$
- (14)  $\{ n \mid \exists c \text{ Customers}(\text{CustomerID}:c, \text{CompanyName}:n) \wedge$   
 $( \forall o_1 \forall p_1 \text{ Order}(\text{OrderID}:o_1, \text{CustomerID}:'\text{LAZYK}') \wedge$   
 $[\text{Order Details}](\text{OrderID}:o_1, \text{ProductID}:p_1) \rightarrow$   
 $\exists o_2 \text{ Orders}(\text{OrderID}:o_2, \text{CustomerID}:c) \wedge$   
 $[\text{Order Details}](\text{OrderID}:o_2, \text{ProductID}:p_1) )$   
 $\wedge ( \forall o_3 \forall p_2 \text{ Order}(\text{OrderID}:o_3, \text{CustomerID}:c) \wedge$   
 $[\text{Order Details}](\text{OrderID}:o_3, \text{ProductID}:p_2) \rightarrow$   
 $\exists o_4 \text{ Orders}(\text{OrderID}:o_4, \text{CustomerID}:'\text{LAZYK}') \wedge$   
 $[\text{Order Details}](\text{OrderID}:o_4, \text{ProductID}:p_2) ) \}$