

CS240A: Database and Knowledge Bases

Project 1 – XQuery Report

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November 30th, 2016

Project Instruction

The transaction-time history of employees and departments for the XYZ corporation are in the stored in the following XML documents: [v-emps.xml](#) and [v-depts.xml](#) .

This project is to write the following queries using XQuery:

1. Selection and Temporal Projection. Retrieve the employment history of employee "Anneke Preusig" (i.e., the departments where she worked and the periods during which she worked there).
2. Temporal Snapshot. Retrieve the name, salary and department of each employee who, on 1995-01-06 was making less than \$44000.
3. Temporal Slicing. For all departments, show their history in the period starting on 1994-05-01 and ending 1996-05-06.
4. Duration. For each employee, show the longest period during which he/she went with no change in salary and his/her salary during that time.
5. Temporal Join. For each employee show title history and his/her manager history.
6. Temporal Count. Print the history of employee count for (i) each department, and (ii) the whole company.
7. Temporal Max. For the employees in department d005, find the maximum of their salaries over time, and print the history of such a maximum.

In this project, I put all the self-defined functions into one file called "helperFunctions.xquery" with,
module namespace helperFunctions = "helperFunctionsforXML";

Thus every time we need to call the self-defined functions, just to import module namespace is fine.

Summary:

To access to the result files directly, please click the links below:

Q1: Selection and Temporal Projection

xml: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query1.xml

sxl: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query1.xml

Q2: Temporal Snapshot.

xml: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query2.xml

sxl: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query2.xml

Q3: Temporal Slicing.

xml: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query3.xml

sxl: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query3.xml

Q4: Duration

xml: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query4.xml

sxl: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query4.xml

Q5: Temporal Join

Title history:

xml:

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query5_view_Title_History.xml

sxl: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query5_title_history.xml

Manager history:

xml:

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query5_view_Manager_History.xml

sxl: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query5_manager_history.xml

Q6-1: Temporal Count - history of employee count for each department

xml: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query61.xml

sxl: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query61.xml

Q6-2: Temporal Count - history of employee count for the whole company

xml: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query62.xml

sxl: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query62.xml

Q7: Temporal Max.

xml: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query7.xml

sxl: https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query7.xml

Project XQuery Implementation

Query1 - Selection and Temporal Projection.

Retrieve the employment history of employee "Anneke Preusig".

The .xquery code is as follows:

(:Query 1 - Selection and Temporal Projection. Retrieve the employment history of employee "Anneke Preusig" (i.e., the departments where she worked and the periods during which she worked there).:)

```
xquery version "1.0";
declare variable $employee-xml as xs:string := "v-emps.xml";
declare variable $department-xml as xs:string := "v-depts.xml";
element history
{
  for $emp in doc($employee-xml)/employees/employee
    where $emp/firstname="Anneke" and $emp/lastname="Preusig"
    return $emp/deptno
}
```

Results:

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="Query1.xsl"?>
<history><deptno tend="9999-12-31" tstart="1990-08-05">d005</deptno></history>
```

With a .xsl

stylesheet, it looks like this:

To view the complete result on browser, please click

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query1.xml

Selection and Temporal Projection - Employment History of Anneke Preusig

Start Date	End Date	Department No
1990-08-05	9999-12-31	d005

Query2 - Temporal Snapshot.

Retrieve the name, salary and department of each employee who, on 1995-01-06 was making less than \$44000.

The .xquery code is as follows:

```
xquery version "1.0";
import module namespace helperFunctions = "helperFunctionsforXML" at
"file:/Users/JohnZ/Desktop/Proj1/helperFunctions.xquery";

declare variable $employee-xml as xs:string := "v-emps.xml";
declare variable $department-xml as xs:string := "v-depts.xml";
declare variable $date := '1995-01-06';
element snapshot
{
    for $emp in doc($employee-xml)//employee[@tstart <= $date and $date <= @tend]
        let $salary := $emp/salary[@tstart <= $date and $date <= @tend], $deptno := $emp/deptno[@tstart <=
$date and $date <= @tend]
        where($salary and $deptno and $salary < 44000 )
        return element

            {node-name($emp)}
            {
                helperFunctions:snapshot(($emp/firstname, $emp/lastname,
helperFunctions:deptNumber($deptno), $salary))
            }
}
```

Results :

The format of query result is like below:

```
▼<snapshot>
  ▼<employee>
    <firstname>Patricio</firstname>
    <lastname>Bridgland</lastname>
    <deptno deptname="Development">d005</deptno>
    <salary>42318</salary>
  </employee>
  ▼<employee>
    <firstname>Mingsen</firstname>
    <lastname>Casley</lastname>
    <deptno deptname="Production">d004</deptno>
    <salary>40919</salary>
  </employee>
```

with the help of .xml stypesheet, the result is as below:

Temporal Snapshot - Name, Salary and Department of Employee Who, on 1995-01-06 was Making Less Than \$44,000

First Name	Last Name	Dept No	Dept Name	Salary
Patricio	Bridgland	d005	Development	42318
Mingsen	Casley	d004	Production	40919
Lucien	Rosenbaum	d008	Research	43485
Basil	Tramer	d009	Customer Service	40484
Mona	Azuma	d003	Human Resources	40000
Kenroku	Malabarba	d004	Production	40000
Amabile	Gomatam	d005	Development	43812
Mariusz	Prampolini	d004	Production	42756
Zhonghui	Zyda	d005	Development	43697
Tzvetan	Hettesheimer	d005	Development	41712
Karsten	Szmurlo	d003	Human Resources	43868
Kasidit	Krzyzanowski	d005	Development	40000
Mabhin	Leijenhurst	d004	Production	41982
Jackson	Kakkad	d009	Customer Service	40000
Genta	Kolvik	d005	Development	42829
Lein	Vendrig	d003	Human Resources	40000
Ramalingam	Gente	d008	Research	40000
Saddek	Gopalakrishnan	d009	Customer Service	40000
Shay	Poulakidas	d005	Development	43428
Hausi	Sidhu	d006	Quality Management	40000
Clyde	Pandrianto	d007	Sales	42419
Khatoun	Imataki	d004	Production	40771
Irena	Reutenauer	d004	Production	43242
Maik	Ushiama	d005	Development	43444
Duro	Coney	d004	Production	40616
Mihalis	Heering	d005	Development	40000
Valter	Cappelletti	d004	Production	40000

To view the complete result on browser, please click

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query2.xml

And the corresponding key part of .xml file is as below:

```
<h2>Temporal Snapshot - Name, Salary and Department of Employee Who, on 1995-01-06 was Making Less Than $44,000</h2>
```

```
<table border="1">
  <tr bgcolor="#9acd32">
    <th style="text-align:center">First Name</th>
    <th style="text-align:center">Last Name</th>
    <th style="text-align:center">Dept No</th>
    <th style="text-align:center">Dept Name</th>
    <th style="text-align:center">Salary</th>
  </tr>
  <xsl:for-each select="snapshot/employee">
    <tr>
      <td><xsl:value-of select="firstname"/></td>
      <td><xsl:value-of select="lastname"/></td>
      <td><xsl:value-of select="deptno"/></td>
      <td><xsl:value-of select="deptno/@deptname"/></td>
      <td><xsl:value-of select="salary"/></td>
    </tr>
  </xsl:for-each>
</table>
```

To view the complete .xml file on browser, please click

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query2.xml

Query3 - Temporal Slicing.

For all departments, show their history in the period starting on 1994-05-01 and ending on 1996-05-06.

The .xquery code is as follows:

```
xquery version "1.0";
import module namespace helperFunctions = "helperFunctionsforXML" at
"file:/Users/JohnZ/Desktop/Proj1/helperFunctions.xquery";

declare variable $employee-xml as xs:string := "v-emps.xml";
declare variable $department-xml as xs:string := "v-depts.xml";

declare variable $tstart := '1994-05-01';
declare variable $tend   := '1996-05-06';
element slicing
{
  for $dept in doc($department-xml)//department[not( @tstart > $tend or $tstart >= @tend)]
    return element
      {node-name($dept)}
      {
        helperFunctions:slice($dept, $tstart, $tend),
        helperFunctions:sliceAll($dept/*[not( @tstart > $tend or $tstart >= @tend)], $tstart, $tend)
      }
}
```

Results:

The format of query result is like below:

```
<slicing>
  <department tstart="1994-05-01" tend="1996-05-06">
    <deptno tstart="1994-05-01" tend="1996-05-06">d001</deptno>
    <deptname tstart="1994-05-01" tend="1996-05-06">Marketing</deptname>
    <mgrno tstart="1994-05-01" tend="1996-05-06">110039</mgrno>
  </department>
  <department tstart="1994-05-01" tend="1996-05-06">
    <deptno tstart="1994-05-01" tend="1996-05-06">d002</deptno>
    <deptname tstart="1994-05-01" tend="1996-05-06">Finance</deptname>
    <mgrno tstart="1994-05-01" tend="1996-05-06">110114</mgrno>
  </department>
```

With the help of .xml stylesheet, the result is as below:

Temporal Slicing - Department History During From 1994-05-01 To 1996-05-06.

Dept No	Dept Name	Manager No	Start Date	End Date
d001	Marketing	110039	1994-05-01	1996-05-06
d002	Finance	110114	1994-05-01	1996-05-06
d003	Human Resources	110228	1994-05-01	1996-05-06
d004	Production	110386	1994-05-01	1996-05-06
d005	Development	110567	1994-05-01	1996-05-06
d006	Quality Management	110800	1994-05-01	1994-06-28
d006	Quality Management	110854	1994-06-28	1996-05-06
d007	Sales	111133	1994-05-01	1996-05-06
d008	Research	111534	1994-05-01	1996-05-06
d009	Cuustomer Service	111877	1994-05-01	1996-01-03
d009	Cuustomer Service	111939	1996-01-03	1996-05-06

To view the complete result on browser, please click

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query3.xml

And the corresponding key part of .xsl file is as below:

```
<h2>Temporal Slicing - Department History During From 1994-05-01 To 1996-05-06.</h2>
<table border="1">
  <tr bgcolor="#9acd32">
    <th style="text-align:center">Dept No</th>
    <th style="text-align:center">Dept Name</th>
    <th style="text-align:center">Manager No</th>
    <th style="text-align:center">Start Date</th>
    <th style="text-align:center">End Date</th>
  </tr>
  <xsl:for-each select="slicing/department/mgrno">
    <tr>
      <td><xsl:value-of select="../deptno"/></td>
      <td><xsl:value-of select="../deptname"/></td>
      <td><xsl:value-of select="text()"/></td>
      <td><xsl:value-of select="@tstart"/></td>
      <td><xsl:value-of select="@tend"/></td>
    </tr>
  </xsl:for-each>
</table>
```

To view the complete .xsl file on browser, please click

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query3.xsl

Query4 - Duration

For each employee, show the longest period during which he/she went with no change in salary and his/her salary during that time.

The .xquery code is as follows:

```
xquery version "1.0";

import module namespace helperFunctions = "helperFunctionsforXML" at
"file:/Users/JohnZ/Desktop/Proj1/helperFunctions.xquery";
declare variable $employee-xml as xs:string := "v-emps.xml";
declare variable $department-xml as xs:string := "v-depts.xml";
element durationCoalescing
{
  for $emp in doc($employee-xml)//employee
    let $durations :=
      for $salary in $emp/salary
      return helperFunctions:untilChangedToNow($salary/@tend) - xs:date($salary/@tstart)
    return element
    {node-name($emp)}

    {
      helperFunctions:slice($emp, '1900-01-01', helperFunctions:currentDate()),
      helperFunctions:untilChangedToAll(($emp/firstname, $emp/lastname)),
      element LongestPeriod {max($durations)},
      for $salary in $emp/salary[helperFunctions:untilChangedToNow(@tend) -
xs:date(@tstart)=max($durations)]
      order by $salary/@tstart, $salary/@tend
      {node-name($salary)}
      {
        helperFunctions:slice($salary, '1900-01-01', helperFunctions:currentDate()),
        string($salary)
      }
    }
}
```

Results:

The format of query result is like below:

```
<durationCoalescing>
  <employee tstart="1986-06-26" tend="2016-11-30">
    <firstname tstart="1986-06-26" tend="2016-11-30">Joe</firstname>
    <lastname tstart="1986-06-26" tend="2016-11-30">Doe</lastname>
    <LongestPeriod>P5275D</LongestPeriod>
    <salary tstart="2002-06-22" tend="2016-11-30">88958</salary>
  </employee>
  <employee tstart="1996-08-03" tend="2016-11-30">
    <firstname tstart="1996-08-03" tend="2016-11-30">Bezalel</firstname>
    <lastname tstart="1996-08-03" tend="2016-11-30">Simmel</lastname>
    <LongestPeriod>P5599D</LongestPeriod>
    <salary tstart="2001-08-02" tend="2016-11-30">72527</salary>
  </employee>
```

The picture below **is part of the whole result**. To access to the whole result, please click the link below.

Duration - Longest Period With No Change in Salary and Corresponding Salary During That Time of Each Employee.

First Name	Last Name	Longest Period	Salary	Start Date	End Date
Joe	Doe	P5275D	88958	2002-06-22	2016-11-30
Bezalel	Simmel	P5599D	72527	2001-08-02	2016-11-30
Parto	Bamford	P5478D	43311	2001-12-01	2016-11-30
Chirstian	Koblick	P5482D	74057	2001-11-27	2016-11-30
Kyoichi	Maliniak	P5561D	94692	2001-09-09	2016-11-30
Anneke	Preusig	P5599D	59755	2001-08-02	2016-11-30
Tzvetan	Zielinski	P5410D	88070	2002-02-07	2016-11-30
Saniya	Kalloufi	P365D	46671	1998-03-11	1999-03-11
Saniya	Kalloufi	P365D	48584	1999-03-11	2000-03-10
Sumant	Peac	P5403D	94409	2002-02-14	2016-11-30
Duangkaew	Piveteau	P5486D	80324	2001-11-23	2016-11-30
Mary	Sluis	P365D	42365	1990-01-22	1991-01-22
Mary	Sluis	P365D	44200	1991-01-22	1992-01-22
Mary	Sluis	P365D	48214	1992-01-22	1993-01-21
Mary	Sluis	P365D	50927	1993-01-21	1994-01-21
Mary	Sluis	P365D	51470	1994-01-21	1995-01-21
Mary	Sluis	P365D	54545	1995-01-21	1996-01-21
Patricio	Bridgland	P5463D	54423	2001-12-16	2016-11-30
Eberhardt	Terkki	P5524D	68901	2001-10-16	2016-11-30
Berni	Genin	P5452D	60598	2001-12-27	2016-11-30

To view the complete result on browser, please click

https://s3.amazonaws.com/z Zhuclacsproj/CS240A_Proj1/RES/Query4.xml

And the corresponding key part of .xsl file is as below:

```
<h2>Duration - Longest Period With No Change in Salary and Corresponding Salary During That Time of Each Employee.</h2>
```

```
    <table border="1">
      <tr bgcolor="#9acd32">
        <th style="text-align:center">First Name</th>
        <th style="text-align:center">Last Name</th>
        <th style="text-align:center">Longest Period</th>
        <th style="text-align:center">Salary</th>
        <th style="text-align:center">Start Date</th>
        <th style="text-align:center">End Date</th>
      </tr>
      <xsl:for-each select="durationCoalescing/employee/salary">
        <tr>
          <td><xsl:value-of select="../firstname"/></td>
          <td><xsl:value-of select="../lastname"/></td>
          <td><xsl:value-of select="../LongestPeriod"/></td>
          <td><xsl:value-of select="text()"/></td>
          <td><xsl:value-of select="@tstart"/></td>
          <td><xsl:value-of select="@tend"/></td>
        </tr>
      </xsl:for-each>
    </table>
```

To view the complete .xsl file on browser, please click

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query4.xsl

Query5 - Temporal Join.

For each employee show title history and his/her manager history.

The .xquery code is as follows:

```
xquery version "1.0";

import module namespace helperFunctions = "helperFunctionsforXML" at
"file:/Users/JohnZ/Desktop/Proj1/helperFunctions.xquery";

declare variable $employee-xml as xs:string := "v-emps.xml";
declare variable $department-xml as xs:string := "v-depts.xml";

element temporalJoin {
  for $emp in doc($employee-xml)//employee
    return element
      {node-name($emp)}
      {
        helperFunctions:slice($emp, '1900-01-01', '9999-12-31'),
        helperFunctions:untilChangedToAll2(($emp/empno,$emp/firstname,$emp/lastname)),
        helperFunctions:untilChangedToAll2(($emp/title, $emp/deptno)),

        element managers
        {
          for $deptno in $emp/deptno, $manager in doc($department-
xml)//department[deptno=$deptno]/mgrno[@tstart<=$deptno/@tend and $deptno/@tstart<=@tend]
            let $deptDuration := helperFunctions:slice($deptno, '1900-01-01','9999-12-31')
            return
              helperFunctions:sliceAll(($manager),string($deptDuration[1]),string($deptDuration[2]))
        }
      }
}
```

Results:

The format of query result is like below:

```
<temporalJoin>
  <employee tstart="1986-06-26" tend="9999-12-31">
    <empno tstart="1986-06-26" tend="9999-12-31">10001</empno>
    <firstname tstart="1986-06-26" tend="9999-12-31">Joe</firstname>
    <lastname tstart="1986-06-26" tend="9999-12-31">Doe</lastname>
    <title tstart="1986-06-26" tend="9999-12-31">Senior Engineer</title>
    <deptno tstart="1986-06-26" tend="9999-12-31">d005</deptno>
    <managers>
      <mgrno tstart="1986-06-26" tend="1992-04-25">110511</mgrno>
      <mgrno tstart="1992-04-25" tend="9999-12-31">110567</mgrno>
    </managers>
  </employee>
```

To show the Title History. (The picture below is part of the whole result. To access to the complete result, please click the link below.)

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query5_view_Title_History.xml

Temporal Join - Title History of Each Employee.

Employee No	First Name	Last Name	Title	Start Date	End Date
10001	Joe	Doe	Senior Engineer	1986-06-26	9999-12-31
10002	Bezalel	Simmel	Staff	1996-08-03	9999-12-31
10003	Parto	Bamford	Senior Engineer	1995-12-03	9999-12-31
10004	Chirstian	Koblick	Engineer	1986-12-01	1995-12-01
10004	Chirstian	Koblick	Senior Engineer	1995-12-01	9999-12-31
10005	Kyoichi	Maliniak	Staff	1989-09-12	1996-09-12
10005	Kyoichi	Maliniak	Senior Staff	1996-09-12	9999-12-31
10006	Anneke	Preusig	Senior Engineer	1990-08-05	9999-12-31
10007	Tzvetan	Zielinski	Staff	1989-02-10	1996-02-11
10007	Tzvetan	Zielinski	Senior Staff	1996-02-11	9999-12-31
10008	Saniya	Kalloufi	Assistant Engineer	1998-03-11	2000-07-31
10009	Sumant	Peac	Assistant Engineer	1985-02-18	1990-02-18
10009	Sumant	Peac	Engineer	1990-02-18	1995-02-18
10009	Sumant	Peac	Senior Engineer	1995-02-18	9999-12-31

And the corresponding key part of .xsl file is as below:

```
<h2>Temporal Join - Title History of Each Employee.</h2>
  <table border="1">
    <tr bgcolor="#9acd32">
      <th style="text-align:center">Employee No</th>
      <th style="text-align:center">First Name</th>
      <th style="text-align:center">Last Name</th>
      <th style="text-align:center">Title</th>
      <th style="text-align:center">Start Date</th>
      <th style="text-align:center">End Date</th>
    </tr>
    <xsl:for-each select="temporalJoin/employee/title">
      <tr>
        <td><xsl:value-of select="../empno"/></td>
        <td><xsl:value-of select="../firstname"/></td>
        <td><xsl:value-of select="../lastname"/></td>
        <td><xsl:value-of select="text()"/></td>
        <td><xsl:value-of select="@tstart"/></td>
        <td><xsl:value-of select="@tend"/></td>
      </tr>
    </xsl:for-each>
  </table>
```

To view the complete .xsl file on browser, please click

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query5_title_history.xsl

To show the **Manager History**. (The picture below is part of the whole result. To access to the complete result, please click the link below.)

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query5_view_Manager_History.xml

Temporal Join - Manager History of Each Employee.

Employee No	First Name	Last Name	Manager No	Start Date	End Date
10001	Joe	Doe	110511	1986-06-26	1992-04-25
10001	Joe	Doe	110567	1992-04-25	9999-12-31
10002	Bezalel	Simmel	111133	1996-08-03	9999-12-31
10003	Parto	Bamford	110386	1995-12-03	1996-08-30
10003	Parto	Bamford	110420	1996-08-30	9999-12-31
10004	Chirstian	Koblick	110303	1986-12-01	1988-09-09
10004	Chirstian	Koblick	110344	1988-09-09	1992-08-02
10004	Chirstian	Koblick	110386	1992-08-02	1996-08-30
10004	Chirstian	Koblick	110420	1996-08-30	9999-12-31
10005	Kyoichi	Maliniak	110183	1989-09-12	1992-03-21
10005	Kyoichi	Maliniak	110228	1992-03-21	9999-12-31
10006	Anneke	Preusig	110511	1990-08-05	1992-04-25

And the corresponding key part of .xsl file is as below:

```
<h2>Temporal Join - Manager History of Each Employee.</h2>
  <table border="1">
    <tr bgcolor="#9acd32">
      <th style="text-align:center">Employee No</th>
      <th style="text-align:center">First Name</th>
      <th style="text-align:center">Last Name</th>
      <th style="text-align:center">Manager No</th>
      <th style="text-align:center">Start Date</th>
      <th style="text-align:center">End Date</th>
    </tr>
    <xsl:for-each select="temporalJoin/employee/managers/mgrno">
      <tr>
        <td><xsl:value-of select="../../empno"/></td>
        <td><xsl:value-of select="../../firstname"/></td>
        <td><xsl:value-of select="../../lastname"/></td>
        <td><xsl:value-of select="text()"/></td>
        <td><xsl:value-of select="@tstart"/></td>
        <td><xsl:value-of select="@tend"/></td>
      </tr>
    </xsl:for-each>
  </table>
```

To view the complete .xsl file on browser, please click

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query5_manager_history.xsl

Query6 - Temporal Count.

Print the history of employee count for (i) each department, and (ii) the whole company.

(i) Each department, the .xquery code is as follows:

```

xquery version "1.0";
declare variable $employee-xml as xs:string := "v-emps.xml";
declare variable $department-xml as xs:string := "v-depts.xml";
declare variable $deptno := doc($department-xml)//deptno;
declare variable $emps := doc($employee-xml);
declare variable $departments := doc($department-xml);
declare variable $deptnos :=
    for $i in distinct-values($deptno)
    order by $i
    return xs:string($i);
<company>
{
    for $deptnumber in $deptnos
    let $depts := $emps/employees/employee[deptno=$deptnumber]/empno
    let $dates :=
        for $date in distinct-values(($depts/@tstart, $depts/@tend))
        order by $date
        return ($date)
    let $max := count($dates)
    let $name := $departments/departments/department[deptno=$deptnumber]/deptname
    return
    <dept>
        {
            for $deptnocur in $deptno
            where data($deptnocur) = $deptnumber
            return $deptnocur
        }
        {$name}
        {
            for $tstart at $pos in ($dates)
            let $y := $depts[@tstart <= $tstart and $tstart < @tend],
                $tend := $dates[$pos + 1]
            where $pos < $max and not($tstart = "9999-12-31")
            return <count tstart="{ $tstart}" tend="{ $tend}">{count($y)}</count>
        }
    </dept>
}
</company>

```

Results:

The format of query result is like below:

```
<company>
  <dept>
    <deptno tend="9999-12-31" tstart="1985-01-01">d001</deptno>
    <deptname tend="9999-12-31" tstart="1985-01-01">Marketing</deptname>
    <count tstart="1986-01-16" tend="1987-03-28">1</count>
    <count tstart="1987-03-28" tend="1987-07-25">2</count>
    <count tstart="1987-07-25" tend="1988-03-30">3</count>
    <count tstart="1988-03-30" tend="1988-04-25">4</count>
    <count tstart="1988-04-25" tend="1988-09-24">5</count>
    <count tstart="1988-09-24" tend="1989-08-24">6</count>
    <count tstart="1989-08-24" tend="1990-01-17">7</count>
    <count tstart="1990-01-17" tend="1991-03-14">8</count>
    <count tstart="1991-03-14" tend="1991-06-24">9</count>
    <count tstart="1991-06-24" tend="1992-04-27">10</count>
    <count tstart="1992-04-27" tend="1992-12-22">11</count>
    <count tstart="1992-12-22" tend="1993-08-03">12</count>
    <count tstart="1993-08-03" tend="1995-02-05">13</count>
    <count tstart="1995-02-05" tend="1995-05-24">14</count>
    <count tstart="1995-05-24" tend="1995-07-22">13</count>
    <count tstart="1995-07-22" tend="1996-05-04">12</count>
    <count tstart="1996-05-04" tend="1996-07-31">13</count>
    <count tstart="1996-07-31" tend="1996-10-04">14</count>
    <count tstart="1996-10-04" tend="1999-01-06">15</count>
    <count tstart="1999-01-06" tend="1999-03-20">14</count>
    <count tstart="1999-03-20" tend="1999-05-15">15</count>
    <count tstart="1999-05-15" tend="2001-10-20">14</count>
    <count tstart="2001-10-20" tend="9999-12-31">13</count>
  </dept>
```

With the help of stylesheet, (the picture below **is part of the whole result**. To access to the complete result, please click the link below.)

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query61.xml

Temporal Count - History of Employee Count for Each Department

Dept No	Dept name	Employee Count	Start Date	End Date
d001	Marketing	1	1986-01-16	1987-03-28
d001	Marketing	2	1987-03-28	1987-07-25
d001	Marketing	3	1987-07-25	1988-03-30
d001	Marketing	4	1988-03-30	1988-04-25
d001	Marketing	5	1988-04-25	1988-09-24
d001	Marketing	6	1988-09-24	1989-08-24
d001	Marketing	7	1989-08-24	1990-01-17
d001	Marketing	8	1990-01-17	1991-03-14
d001	Marketing	9	1991-03-14	1991-06-24
d001	Marketing	10	1991-06-24	1992-04-27

And the corresponding key part of .xml file is as below:

```
<h2>Temporal Count - History of Employee Count for Each Department</h2>
  <table border="1">
    <tr bgcolor="#9acd32">
      <th style="text-align:center">Dept No</th>
      <th style="text-align:center">Dept name</th>
      <th style="text-align:center">Employee Count</th>
      <th style="text-align:center">Start Date</th>
      <th style="text-align:center">End Date</th>
    </tr>
    <xsl:for-each select="company/dept/count">
      <tr>
        <td><xsl:value-of select="../deptno"/></td>
        <td><xsl:value-of select="../deptname"/></td>
        <td><xsl:value-of select="text()"/></td>
        <td><xsl:value-of select="@tstart"/></td>
        <td><xsl:value-of select="@tend"/></td>
      </tr>
    </xsl:for-each>
  </table>
```

To view the complete .xml file on browser, please click

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query61.xml

(ii)The whole company, the .xquery code is as follows:

```
xquery version "1.0";

declare variable $employee-xml as xs:string := "v-emps.xml";
declare variable $department-xml as xs:string := "v-depts.xml";
declare variable $empno := doc($employee-xml)//empno;
declare variable $dept-no := doc($employee-xml)//deptno;
declare variable $start-dates :=
    for $i in distinct-values($empno/@tstart)
        order by $i
        return xs:date($i);
declare variable $end-dates :=
    for $i in distinct-values($empno/@tend)
        order by $i
        return xs:date($i);
declare variable $combined-dates :=
    for $i in distinct-values(($start-dates, $end-dates))
        order by $i
        return $i;
declare variable $employee-num :=
    for $start at $pos in $combined-dates
        let $x := $empno[@tstart <= $start and $start < @tend]
        let $cnt := count($x)
        order by $start
        return <count date="{ $start }">{xs:decimal($cnt)}</count>;
declare variable $max := count($employee-num);
<whole-company>
{
    for $tstart at $pos in $employee-num
        let $tend := $employee-num[$pos + 1]
        where( $pos < $max )
        return <count tstart="{ $tstart/@date }" tend="{ $tend/@date }">
            {string($employee-num[$pos])}</count>
}
</whole-company>
```


Results:

The format of query result is like below:

```
<whole-company>
  <count tstart="1985-02-15" tend="1985-02-18">1</count>
  <count tstart="1985-02-18" tend="1985-02-21">3</count>
  <count tstart="1985-02-21" tend="1985-02-24">4</count>
  <count tstart="1985-02-24" tend="1985-03-19">5</count>
  <count tstart="1985-03-19" tend="1985-04-02">6</count>
  <count tstart="1985-04-02" tend="1985-05-13">7</count>
  <count tstart="1985-05-13" tend="1985-05-17">8</count>
  <count tstart="1985-05-17" tend="1985-06-05">9</count>
  <count tstart="1985-06-05" tend="1985-06-16">10</count>
  <count tstart="1985-06-16" tend="1985-07-06">11</count>
  <count tstart="1985-07-06" tend="1985-07-30">12</count>
  <count tstart="1985-07-30" tend="1985-08-02">13</count>

  .....

</whole-company>
```

With the help of stypesheet, (the picture below **is part of the whole result**. To access to the complete result, please click the link below.)

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query62.xml

Temporal Count - History of Employee Count for Whole Company

Employee Count	Start Date	End Date
1	1985-02-15	1985-02-18
3	1985-02-18	1985-02-21
4	1985-02-21	1985-02-24
5	1985-02-24	1985-03-19
6	1985-03-19	1985-04-02
7	1985-04-02	1985-05-13
8	1985-05-13	1985-05-17
9	1985-05-17	1985-06-05
10	1985-06-05	1985-06-16
11	1985-06-16	1985-07-06

And the corresponding key part of .xsl file is as below:

```
<h2>Temporal Count - History of Employee Count for Whole Company</h2>
  <table border="1">
    <tr bgcolor="#9acd32">
      <th style="text-align:center">Employee Count</th>
      <th style="text-align:center">Start Date</th>
      <th style="text-align:center">End Date</th>

    </tr>
    <xsl:for-each select="whole-company/count">
      <tr>
        <td><xsl:value-of select="text()"/></td>
        <td><xsl:value-of select="@tstart"/></td>
        <td><xsl:value-of select="@tend"/></td>

      </tr>
    </xsl:for-each>
  </table>
```

To view the complete .xsl file on browser, please click

https://s3.amazonaws.com/zzhuclacsproj/CS240A_Proj1/RES/Query62.xsl

Query7 - Temporal Max

For the employees in department d005, find the maximum of their salaries over time, and print the history of such a maximum.

the .xquery code is as follows:

```
xquery version "1.0";

import module namespace helperFunctions = "helperFunctionsforXML" at
"file:/Users/JohnZ/Desktop/Proj1/helperFunctions.xquery";

declare variable $employee-xml as xs:string := "v-emps.xml";
declare variable $department-xml as xs:string := "v-depts.xml";
declare variable $emps := doc($employee-xml)/employees/employee[deptno='d005'];
declare variable $start-dates :=
    for $i in distinct-values($emps/salary/@tstart)
    order by $i
    return xs:date($i);
declare variable $end-dates :=
    for $i in distinct-values($emps/salary/@tend)
    order by $i
    return xs:date($i);
declare variable $combined-dates :=
    for $i in distinct-values(($start-dates, $end-dates))
    order by $i
    return $i;
declare variable $temporal-max :=
    for $start at $pos in $combined-dates
    let $x := $emps/salary[@tstart <= $start and $start < @tend]
    let $max-salary := max($x)
    order by $start
    return <max date="{ $start }">{xs:float($max-salary)}</max>;
declare variable $maxCount := count($temporal-max);
declare variable $max-date :=
    for $start at $pos in $temporal-max
    let $tend := $temporal-max[$pos + 1]
    where( $pos < $maxCount )
    return <max tstart="{ $start/@date }" tend="{ $tend/@date }">{string($temporal-max[$pos])}</max>;
declare variable $unique-salaries := distinct-values($max-date);
```

```

declare variable $coalesce :=
  for $v in $unique-salaries
    let $sal := $max-date[text()=$v]
    let $start := '9999-12-31'
    let $end := '1900-12-31'
    let $s :=
      for $x in $sal
        let $start := helperFunctions:minDate($x/@tstart,$start)
      return min($start)
    let $e :=
      for $x in $sal
        let $end := helperFunctions:maxDate($x/@tend,$end)
      return max($end)
    return <max tstart="{min($s)}" tend="{max($e)}">{string($v)}</max>;
<company>
{
  for $value in $coalesce
    return $value
}
</company>

```

Results:

The format of query result is like below:

```
<company>
  <max tstart="1985-02-24" tend="1985-05-17">40000</max>
  <max tstart="1985-05-17" tend="1986-02-26">66280</max>
  <max tstart="1986-02-26" tend="1986-05-17">69736</max>
  <max tstart="1986-05-17" tend="1987-02-26">70375</max>
  <max tstart="1987-02-26" tend="1987-03-23">72147</max>
  <max tstart="1987-03-23" tend="1987-11-16">73259</max>
  <max tstart="1987-11-16" tend="1988-02-26">74014</max>
  <max tstart="1988-02-26" tend="1988-05-16">76616</max>
  <max tstart="1988-05-16" tend="1989-02-25">76648</max>
  <max tstart="1989-02-25" tend="1989-11-15">78885</max>
  <max tstart="1989-11-15" tend="1990-02-25">79310</max>
  <max tstart="1990-02-25" tend="1991-02-25">82819</max>
  <max tstart="1991-02-25" tend="1992-02-25">84064</max>
  <max tstart="1992-02-25" tend="1992-05-15">84161</max>
  <max tstart="1992-05-15" tend="1993-05-15">86445</max>
  <max tstart="1993-05-15" tend="1994-05-15">90341</max>
  <max tstart="1994-05-15" tend="1995-05-15">89891</max>
  <max tstart="1995-05-15" tend="1996-05-14">94064</max>
  <max tstart="1996-05-14" tend="1997-05-14">97898</max>
  <max tstart="1997-05-14" tend="1998-05-14">100587</max>
  <max tstart="1998-05-14" tend="1999-05-14">102901</max>
  <max tstart="1999-05-14" tend="2000-05-13">105128</max>
  <max tstart="2000-05-13" tend="2001-05-13">105845</max>
  <max tstart="2001-05-13" tend="2002-05-13">106912</max>
  <max tstart="2002-05-13" tend="9999-12-31">110212</max>
</company>
```

With the help of stypesheet,

Temporal Max - History of Maximum Salaries of Employees in Department d005

Maximum Salary	Start Date	End Date
40000	1985-02-24	1985-05-17
66280	1985-05-17	1986-02-26
69736	1986-02-26	1986-05-17
70375	1986-05-17	1987-02-26
72147	1987-02-26	1987-03-23
73259	1987-03-23	1987-11-16
74014	1987-11-16	1988-02-26
76616	1988-02-26	1988-05-16
76648	1988-05-16	1989-02-25
78885	1989-02-25	1989-11-15
79310	1989-11-15	1990-02-25
82819	1990-02-25	1991-02-25
84064	1991-02-25	1992-02-25
84161	1992-02-25	1992-05-15
86445	1992-05-15	1993-05-15
90341	1993-05-15	1994-05-15
89891	1994-05-15	1995-05-15
94064	1995-05-15	1996-05-14
97898	1996-05-14	1997-05-14
100587	1997-05-14	1998-05-14
102901	1998-05-14	1999-05-14
105128	1999-05-14	2000-05-13
105845	2000-05-13	2001-05-13
106912	2001-05-13	2002-05-13
110212	2002-05-13	9999-12-31

To view the complete result on browser, please click

https://s3.amazonaws.com/z Zhuclacsproj/CS240A_Proj1/RES/Query7.xml

And the corresponding key part of .xsl file is as below:

```
<h2>Temporal Max - History of Maximum Salaries of Employees in Department d005</h2>
  <table border="1">
    <tr bgcolor="#9acd32">
      <th style="text-align:center">Maximum Salary</th>
      <th style="text-align:center">Start Date</th>
      <th style="text-align:center">End Date</th>
    </tr>
    <xsl:for-each select="company/max">
      <tr>
        <td><xsl:value-of select="text()"/></td>
        <td><xsl:value-of select="@tstart"/></td>
        <td><xsl:value-of select="@tend"/></td>
      </tr>
    </xsl:for-each>
  </table>
```

**To view
the**

complete .xsl file on browser, please click

https://s3.amazonaws.com/z Zhuclacsproj/CS240A_Proj1/RES/Query7.xsl

The code for helperFunctions.xquery is as below:

```
module namespace helperFunctions = "helperFunctionsforXML";

(:Return the current date - timestamp:)
declare function helperFunctions:currentDate() as xs:string
{
  xs:string(fn:adjust-date-to-timezone(current-date(), ()))
};

(:Convert 'Until Changed' to current timestamp:)
declare function helperFunctions:untilChangedToNow($x as xs:string) as xs:date
{
  if( $x="9999-12-31" )
  then xs:date(helperFunctions:currentDate())
  else xs:date($x)
};

(:Return the minimum of two dates:)
declare function helperFunctions:minDate($x1 as xs:string, $x2 as xs:string) as xs:date
{
  if(xs:date($x1)>xs:date($x2))
  then xs:date($x2)
  else xs:date($x1)
};

(:Return Maximum of two dates:)
declare function helperFunctions:maxDate($x1 as xs:string, $x2 as xs:string) as xs:date
{
  if(xs:date($x1)>xs:date($x2))
  then xs:date($x1)
  else xs:date($x2)
};

(:Convert all elements from Until Changed to Current-Timestamp:)
declare function helperFunctions:untilChangedToAll($elements as element(*) as element(*)*
{
  for $element in $elements
```



```

order by $element/@tstart, $element/@tend
return element
{node-name($element)}
{
    helperFunctions:slice($element, '1900-01-01', helperFunctions:currentDate()),
    string($element)
}
};

(:V2: Convert all elements from Until Changed to Current-Timestamp:)
declare function helperFunctions:untilChangedToAll2($elements as element(*)*) as element(*)*
{
    for $element in $elements
    order by $element/@tstart, $element/@tend
    return element
    {node-name($element)}
    {
        helperFunctions:slice($element, '1900-01-01', '9999-12-31'),
        string($element)
    }
};

(:Return the snapshot of the data:)
declare function helperFunctions:snapshot($elements as element(*)*) as element(*)*
{
    for $element in $elements
    return element
    {node-name($element)}
    {
        $element/@*[name(.)!="tend" and name(.)!="tstart"],
        data($element)
    }
};

(:Get the department number of each element:)
declare function helperFunctions:deptNumber( $deptnos as element(*)* ) as element(*)*
{
    for $deptno in $deptnos
    return element

```

```

{node-name($deptno)}
{
    $deptno/@*,
    attribute deptname {string(doc("v-depts.xml")//department[deptno=$deptno]/deptname)},
    string($deptno)
}
};

(:Return element which lie between start & end date:)
declare function helperFunctions:slice( $element as element(), $start as xs:string, $stop as xs:string ) as attribute()*
{
    attribute tstart {helperFunctions:maxDate($start,$element/@tstart)},
    attribute tend    {helperFunctions:minDate($stop,$element/@tend)},
    $element/@*[name(.)!="tend" and name(.)!="tstart"]
};

declare function helperFunctions:sliceAll( $elements as element()*,
$start as xs:string, $stop as xs:string ) as element()*
{
    for $element in $elements
    return
    element {node-name($element)}
    {
        helperFunctions:slice($element, $start, $stop),
        string($element)
    }
};

```