

# CA IDMS SQL Network DB Enhancements for Modernization

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CA Technologies



CA IDMS™ Technical Conference

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## Abstract

- Customers want to modernize their CA IDMS network database applications to take advantage of modern skill sets and technologies.
- The vision of CA IDMS 19.0 is to improve CA IDMS modernization using open source or 3rd party tools for better flexibility and improved productivity.
- This session discusses new CA IDMS SQL features that enable IDMS network database access using standard SQL without major limitations.



## Agenda

WHAT'S THE REQUIREMENT?

CURRENT LIMITATIONS WITH CA IDMS SQL ACCESS TO NETWORK DBS

VIRTUAL FOREIGN KEYS

EXAMPLES

Q&A

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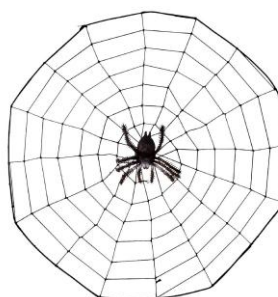
# What's the requirement?

## CA IDMS 19.0 Application Modernization focus

- Enable modern app dev with the CA IDMS database platform



*CA IDMS SQL enhancements  
to enable Java, modern tools*



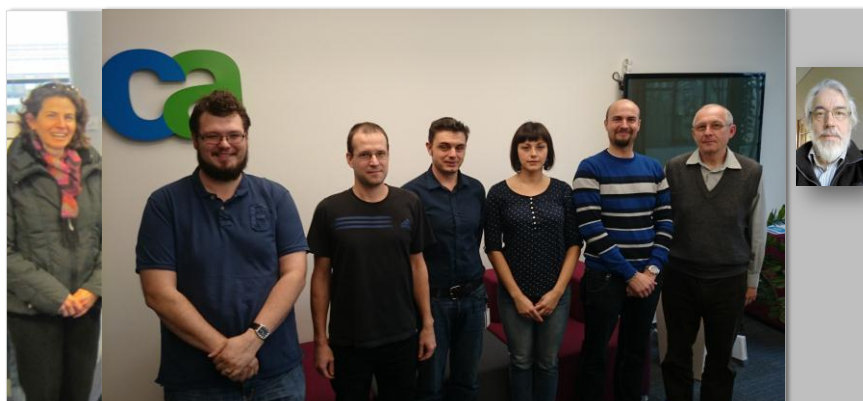
*Enable Web services integration with  
CA IDMS applications*

## CA IDMS™ SQL Project

Greg Beedy	<i>Senior Principal Product Manager &amp; Product Owner</i>
Jean-Paul de Feyter	<i>Software Architect</i>
Jan Krcin	<i>Senior Software Engineer</i>
Sheila Miller	<i>Senior Product Manager</i>
Lukas Patera	<i>Senior Software Engineer</i>
Milos Prichystal	<i>Principal Software Engineer</i>
Teri Schnitt	<i>Principal Software Engineer</i>
Miriam Salakova	<i>Scrum Master</i>
Marco Zimmerman	<i>Information Services Engineer</i>



## CA IDMS™ SQL Team photo



Teri Michal Jan Marco Miriam Lukas Milos Jean-Paul

## CA IDMS 19.0 Enhanced SQL Goals

- Allow use of open source or 3rd party tools to enable increased flexibility and improved productivity with current skill sets
- Map CA IDMS network records and sets directly to tables and objects
- Access CA IDMS network data using standard SQL without limitations
- Use standard SQL to access (SELECT) and update (INSERT/UPDATE) any record in the CA IDMS network database
- Enable modern languages and tools such as SQL, Java, Hibernate, .NET and C#

## Modern development



*Michelle, the modern  
application developer*

- Standard languages
- Common tools
- Code generation
- Flexibility
- Productivity

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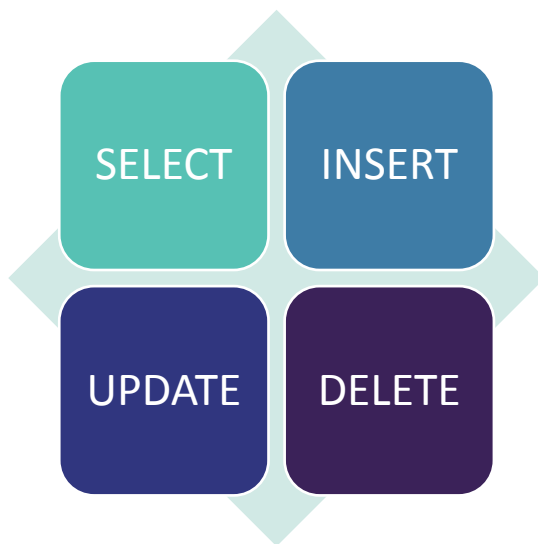
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## SQL limitations with CA IDMS network db access

## SQL DML access limitations for network databases



## SELECT against CA IDMS network databases

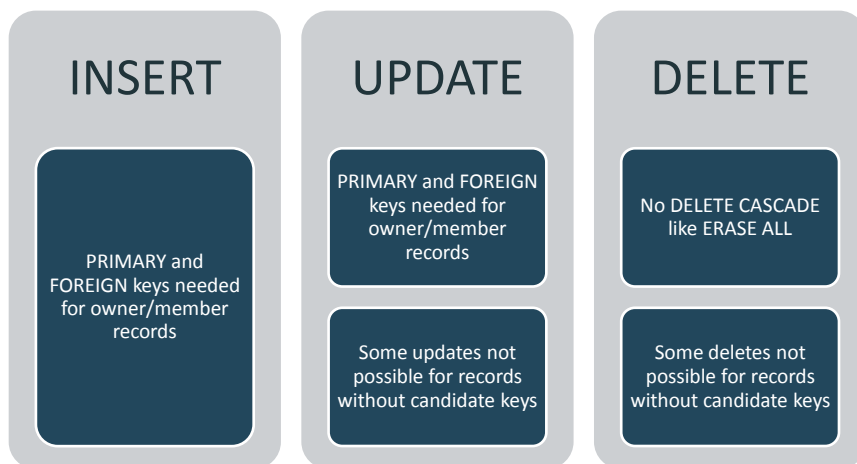
**PRIMARY and FOREIGN keys needed for owner/member records**

- Defined in schema
- Requires restructure
- Requires application changes

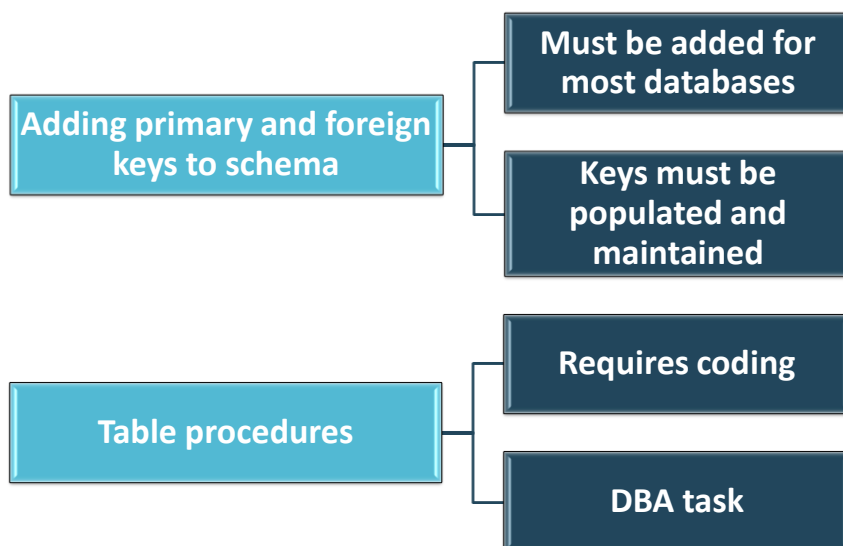
**IDMS-specific extensions**

- `SELECT * FROM DEPARTMENT, EMPLOYEE WHERE "DEPT-EMPLOYEE"`
- Non-standard
- No metadata for tools

## INSERT, UPDATE, DELETE with CA IDMS network databases



## CA IDMS SQL approaches for network database access



## Additional customer challenges

Availability of  
CA IDMS  
developers for  
navigational DML,  
COBOL, CA ADS

Modern apps and  
tools speak SQL  
but usage is  
limited against  
CA IDMS network  
databases

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## Virtual Keys



## What is a Virtual Key?

### Virtual *Primary* Key

- Uniquely identifies the row of a table

### Virtual *Foreign* Key

- Uniquely identifies row of a referenced table

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## Virtual Key Attributes

Pseudo column in the SQL table associated with a network record

Not related to a defined record element

Included in *all* column list (SELECT \* or INSERT) only if SQL schema requests it

Reference able as a user-defined column in most cases

**TWO FLAVORS OF VIRTUAL KEYS**

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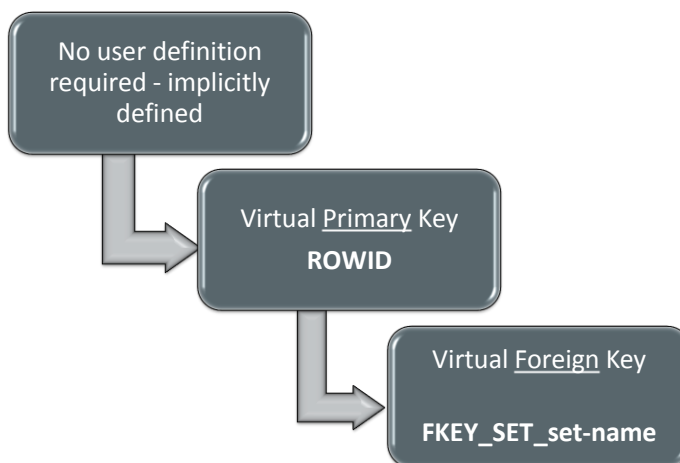
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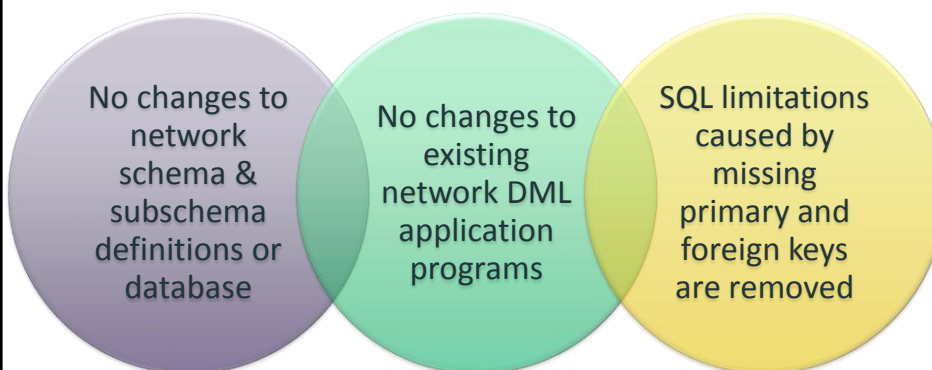
## 1) User Defined Virtual Keys

- Definition similar to real primary/foreign key definition
- Seemingly simple and natural to use in SQL DML
- BUT there are issues...
  - They require network schema updates*
  - What if record has no candidate key?*
  - Unsorted sets or sorted sets with duplicates allowed*
  - Non-mandatory or optional sets*
  - ...

## 2) System Defined Virtual Keys



## System Defined Virtual Key Benefits



## Virtual Primary Key - ROWID

Available since CA IDMS 16.0

Pseudo column

Value not persistent

Datatype TID (8 bytes, contains DBKey of record)

Available for every table

Not nullable for base tables

Virtual Foreign Key = FKEY\_SET\_<set-name>

Pseudo column

Datatype TID (8 bytes, contains DBKey of set owner)

Available for every set in which record is member

Always nullable

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## System defined virtual keys - Summary



- Address issues with user defined virtual keys
- No database changes needed
- No network definition changes needed
- Flexible navigation, same as network DML



Easy and non-disruptive adoption

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## Experts' views on primary keys

*A couple of interesting articles on natural versus surrogate keys:*

<http://www.techrepublic.com/article/the-great-primary-key-debate/>

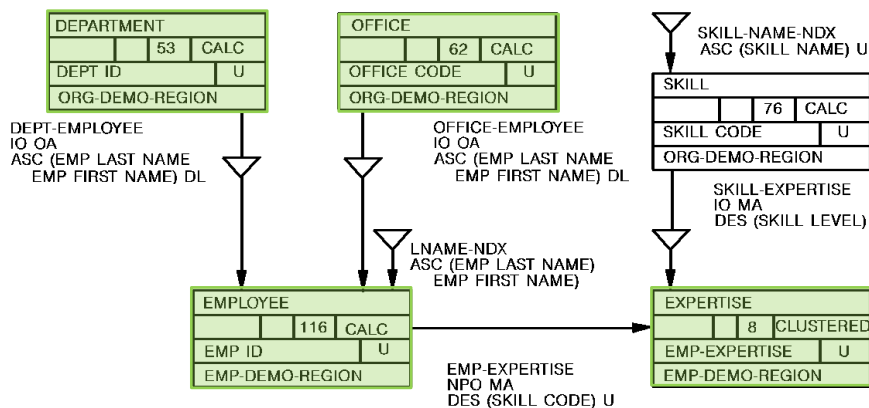
➤ search "the great primary key debate")

<https://www.simple-talk.com/sql/learn-sql-server/primary-key-primer-for-sql-server/>

➤ search "primary key primer for sql server")

## Virtual Foreign Key Examples

## Subset of Employee Demo network database



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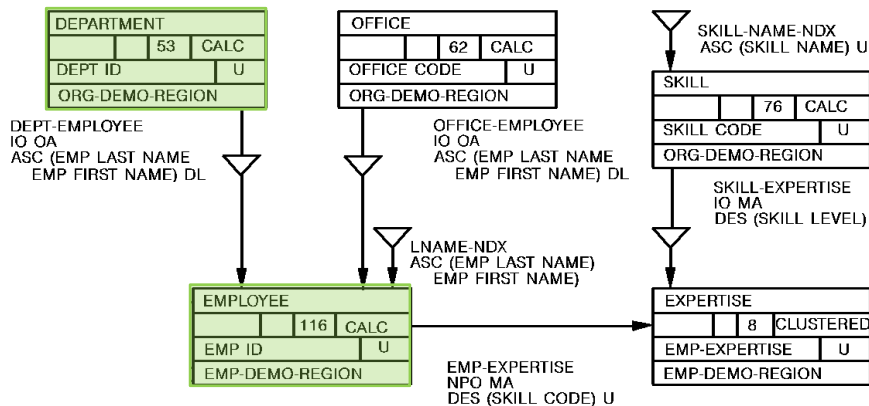
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## Example 1. Standard SQL to obtain owner data

Obtain DEPARTMENT data of an EMPLOYEE:



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## Example 1. Standard SQL to obtain owner data

Obtain DEPARTMENT data of an EMPLOYEE:

```
select *
  from DEPARTMENT where ROWID =
    (select FKEY_SET_DEPT_EMPLOYEE
     from EMPLOYEE
     where EMP_ID = 11)
```

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## Example 1. Standard SQL to obtain owner data

Results

ROWID	DEPT_ID_0410	DEPT_NAME_0410	DEPT_HEAD_ID_0410
X'0125A20100000003'	2000	ACCOUNTING AND PAYROLL	11

30



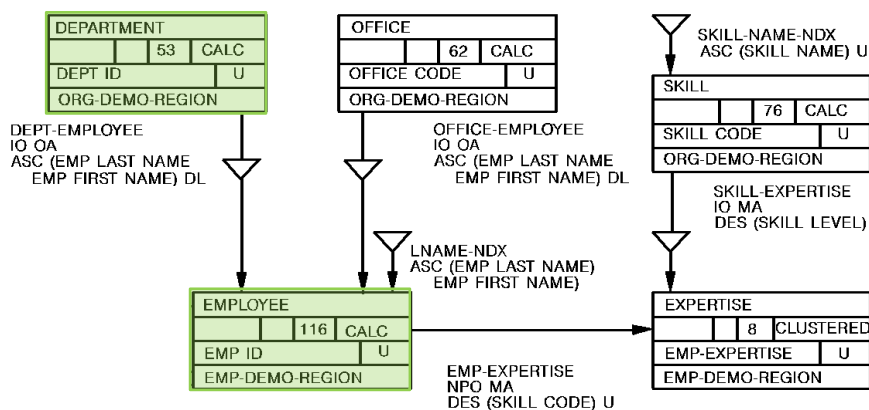
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## Example 2. Standard SQL to join records

Join DEPARTMENT and EMPLOYEE



## Example 2. Standard SQL to join records

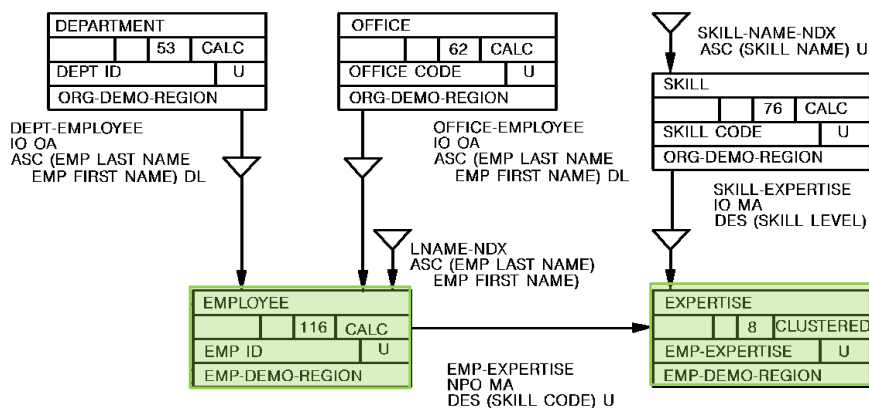
Join DEPARTMENT and EMPLOYEE

```
select * from DEPARTMENT d,
        EMPLOYEE e
        where d.ROWID =
        e.FKEY_SET_DEPT_EMPLOYEE
```



### Example 3. Standard SQL to update records member of a set

Update all EXPERTISE records for an EMPLOYEE



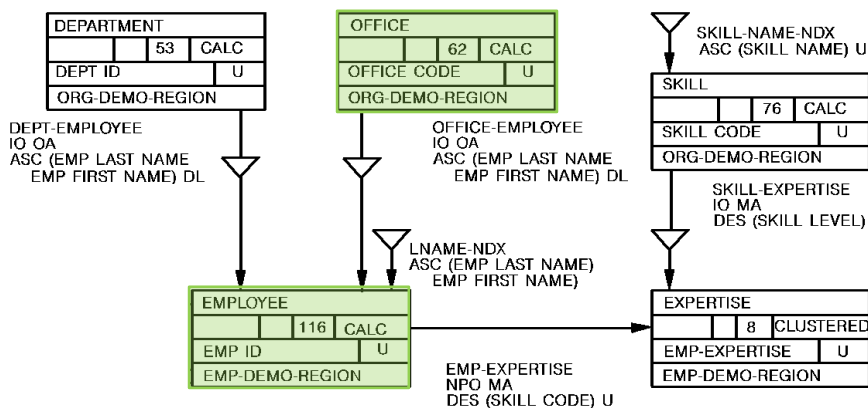
### Example 3. Standard SQL to update records member of a set

Update all EXPERTISE records for an EMPLOYEE

```
update EXPERTISE
set SKILL_LEVEL_0425 =
SKILL_LEVEL_0425 + 1
where FKEY_SET_EMP_EXPERTISE =
(select ROWID
from EMPLOYEE
where EMP_ID = 1001)
```

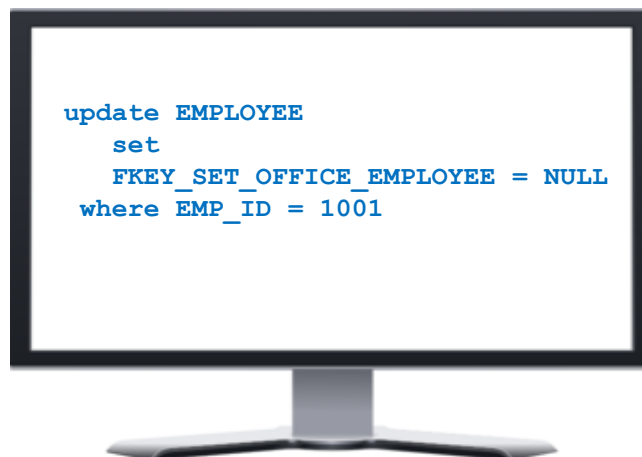
## Example 4. Standard SQL to change relationship

Show that an EMPLOYEE is no longer working in any OFFICE



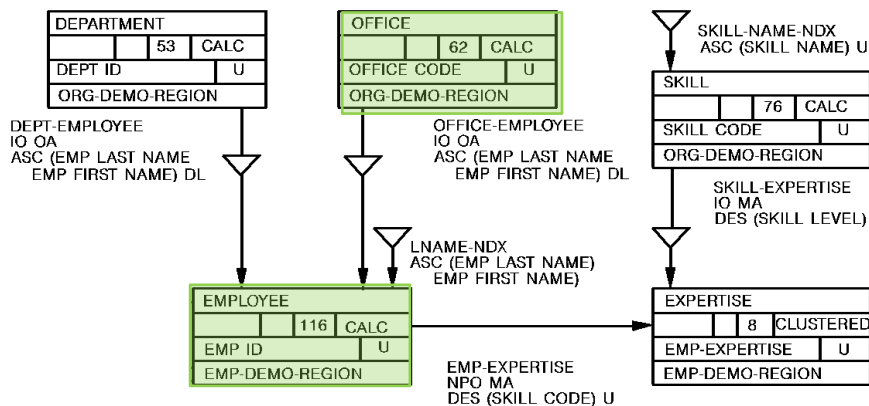
## Example 4. Standard SQL to change relationship

Show that an EMPLOYEE is no longer working in any OFFICE



## Example 5. Standard SQL to change relationship

Update an EMPLOYEE not currently in an office, to be assigned to OFFICE 002

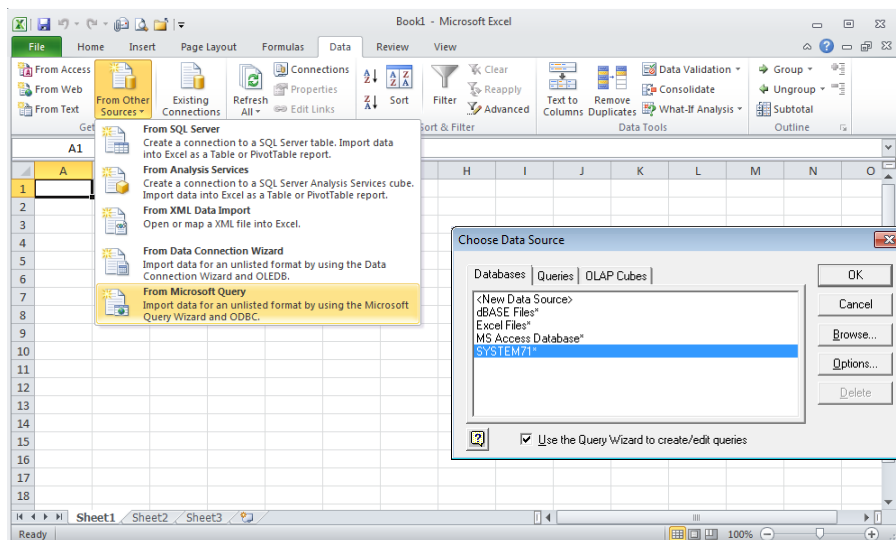


## Example 5. Standard SQL to change relationship

Update an EMPLOYEE not currently in an office, to be assigned to OFFICE 002

```
update EMPLOYEE
  set FKEY_SET_OFFICE_EMPLOYEE =
    (select ROWID
     from OFFICE
     where OFFICE_CODE_0450 = '002')
where EMP_ID = 1001
```

## Tools – MS Excel



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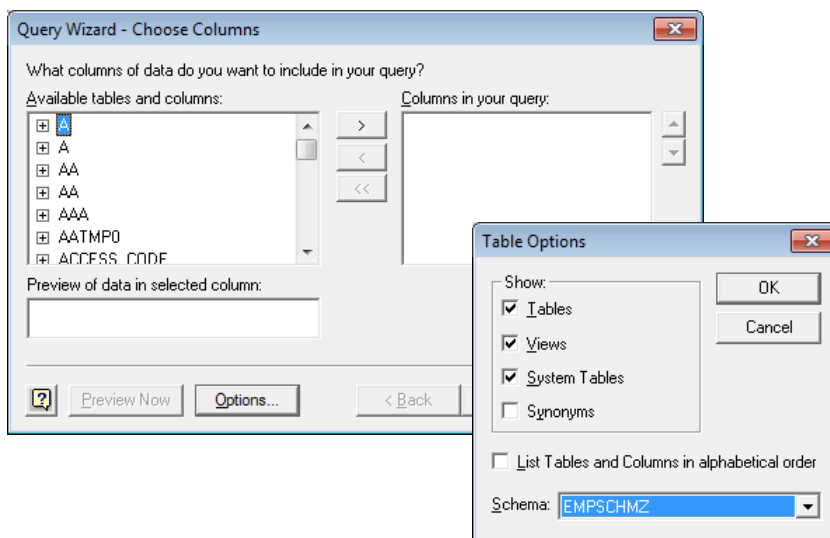


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## Tools – MS Excel



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## Tools – MS Excel

Query Wizard - Choose Columns

What columns of data do you want to include in your query?

Available tables and columns:

- COVERAGE
- DENTAL-CLAIM
- DEPARTMENT
  - DEPT\_HEAD\_ID\_0410
- EMPLOYEE
  - EMP\_ID

Columns in your query:

- DEPT\_ID\_0410
- DEPT\_NAME\_0410
- ROWID

Preview of data in selected column:

Buttons: ? Preview Now Options... < Back Next > Cancel

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## Tools – MS Excel

Query Wizard - Choose Columns

What columns of data do you want to include in your query?

Available tables and columns:

- EMPLOYEE
  - EMP\_STREET
  - EMP\_CITY
  - EMP\_STATE
  - EMP\_ZIP\_FIRST\_FIVE
  - EMP\_ZIP\_LAST\_FOUR

Columns in your query:

- DEPT\_ID\_0410
- DEPT\_NAME\_0410
- ROWID
- EMP\_ID
- EMP\_FIRST\_NAME
- EMP\_LAST\_NAME
- FKEY\_SET\_DEPT\_EMPLOYEE

Preview of data in selected column:

Buttons: ? Preview Now Options... < Back Next > Cancel

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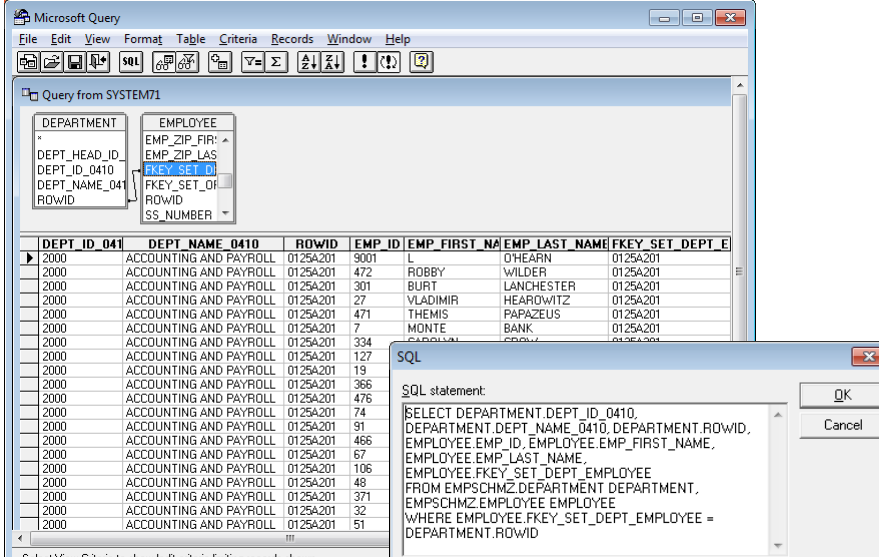


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## Tools – MS Excel



Microsoft Query

Query from SYSTEM71

DEPARTMENT

- DEPT\_HEAD\_ID
- DEPT\_ID\_0410
- DEPT\_NAME\_0410
- ROWID

EMPLOYEE

- EMP\_ZIP\_FIR
- EMP\_ZIP\_LAS
- FKEY\_SET\_DEPT\_EMPLOYEE
- FKEY\_SET\_DEPT\_EMPLOYEE
- ROWID
- SS\_NUMBER

DEPT_ID_0410	DEPT_NAME_0410	ROWID	EMP_ID	EMP_FIRST_NAME	EMP_LAST_NAME	FKEY_SET_DEPT_EMPLOYEE
2000	ACCOUNTING AND PAYROLL	0125A201	9001	L	O'HEARN	0125A201
2000	ACCOUNTING AND PAYROLL	0125A201	472	ROBBY	WILDER	0125A201
2000	ACCOUNTING AND PAYROLL	0125A201	301	BURT	LANCHESTER	0125A201
2000	ACCOUNTING AND PAYROLL	0125A201	27	VLADIMIR	HEAROWITZ	0125A201
2000	ACCOUNTING AND PAYROLL	0125A201	471	THEMIS	PAPAZEUS	0125A201
2000	ACCOUNTING AND PAYROLL	0125A201	7	MONTE	BANK	0125A201
2000	ACCOUNTING AND PAYROLL	0125A201	334	CAROLYN	CROW	0125A201
2000	ACCOUNTING AND PAYROLL	0125A201	127			
2000	ACCOUNTING AND PAYROLL	0125A201	19			
2000	ACCOUNTING AND PAYROLL	0125A201	366			
2000	ACCOUNTING AND PAYROLL	0125A201	476			
2000	ACCOUNTING AND PAYROLL	0125A201	74			
2000	ACCOUNTING AND PAYROLL	0125A201	91			
2000	ACCOUNTING AND PAYROLL	0125A201	466			
2000	ACCOUNTING AND PAYROLL	0125A201	67			
2000	ACCOUNTING AND PAYROLL	0125A201	106			
2000	ACCOUNTING AND PAYROLL	0125A201	48			
2000	ACCOUNTING AND PAYROLL	0125A201	371			
2000	ACCOUNTING AND PAYROLL	0125A201	32			
2000	ACCOUNTING AND PAYROLL	0125A201	51			

Select View Criteria to show/edit criteria limiting records shown

SQL statement:

```
SELECT DEPARTMENT.DEPT_ID_0410,
DEPARTMENT.DEPT_NAME_0410, DEPARTMENT.ROWID,
EMPLOYEE.EMP_ID, EMPLOYEE.EMP_FIRST_NAME,
EMPLOYEE.EMP_LAST_NAME,
EMPLOYEE.FKEY_SET_DEPT_EMPLOYEE
FROM EMPSCHEM2.DEPARTMENT DEPARTMENT,
EMPSCHEM2.EMPLOYEE EMPLOYEE
WHERE EMPLOYEE.FKEY_SET_DEPT_EMPLOYEE =
DEPARTMENT.ROWID
```

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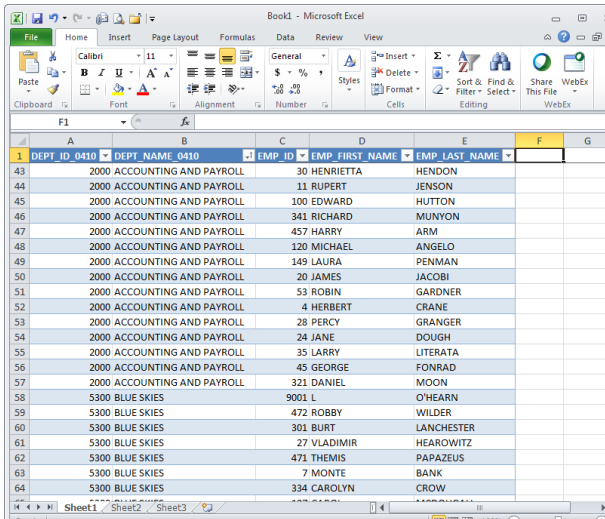


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## Tools – MS Excel



DEPT_ID_0410	DEPT_NAME_0410	EMP_ID	EMP_FIRST_NAME	EMP_LAST_NAME
2000	ACCOUNTING AND PAYROLL	30	HENRIETTA	HENDON
2000	ACCOUNTING AND PAYROLL	11	RUPERT	JENSON
2000	ACCOUNTING AND PAYROLL	100	EDWARD	HUTTON
2000	ACCOUNTING AND PAYROLL	341	RICHARD	MUNYON
2000	ACCOUNTING AND PAYROLL	457	HARRY	ARM
2000	ACCOUNTING AND PAYROLL	120	MICHAEL	ANGELO
2000	ACCOUNTING AND PAYROLL	149	LAURA	PENMAN
2000	ACCOUNTING AND PAYROLL	20	JAMES	JACOBI
2000	ACCOUNTING AND PAYROLL	53	ROBIN	GARDNER
2000	ACCOUNTING AND PAYROLL	4	HERBERT	CRANE
2000	ACCOUNTING AND PAYROLL	28	PERCY	GRANGER
2000	ACCOUNTING AND PAYROLL	24	JANE	DOUGH
2000	ACCOUNTING AND PAYROLL	35	LARRY	LITERATA
2000	ACCOUNTING AND PAYROLL	45	GEORGE	FONRAD
2000	ACCOUNTING AND PAYROLL	321	DANIEL	MOON
5300	BLUE SKIES	9001	L	O'HEARN
5300	BLUE SKIES	472	ROBBY	WILDER
5300	BLUE SKIES	301	BURT	LANCHESTER
5300	BLUE SKIES	27	VLADIMIR	HEAROWITZ
5300	BLUE SKIES	471	THEMIS	PAPAZEUS
5300	BLUE SKIES	7	MONTE	BANK
5300	BLUE SKIES	334	CAROLYN	CROW

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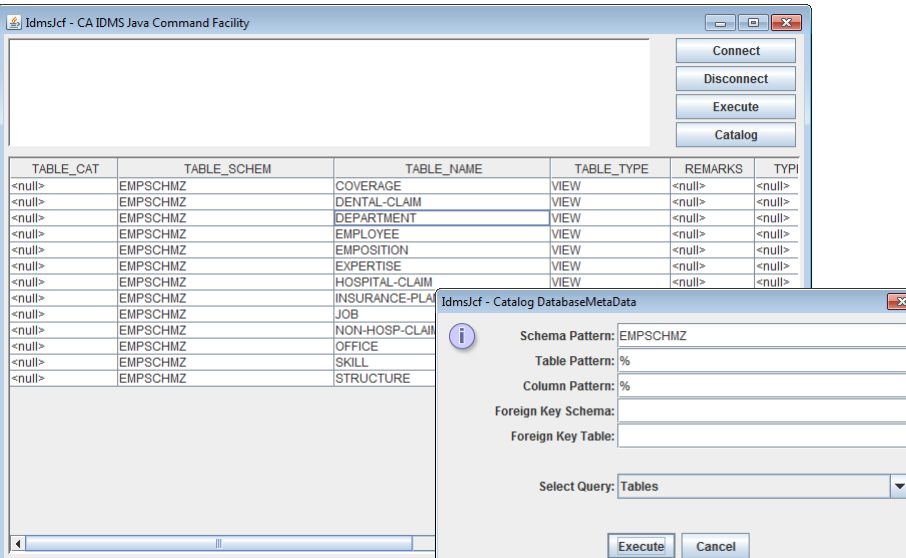


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## Tools – Java JCF



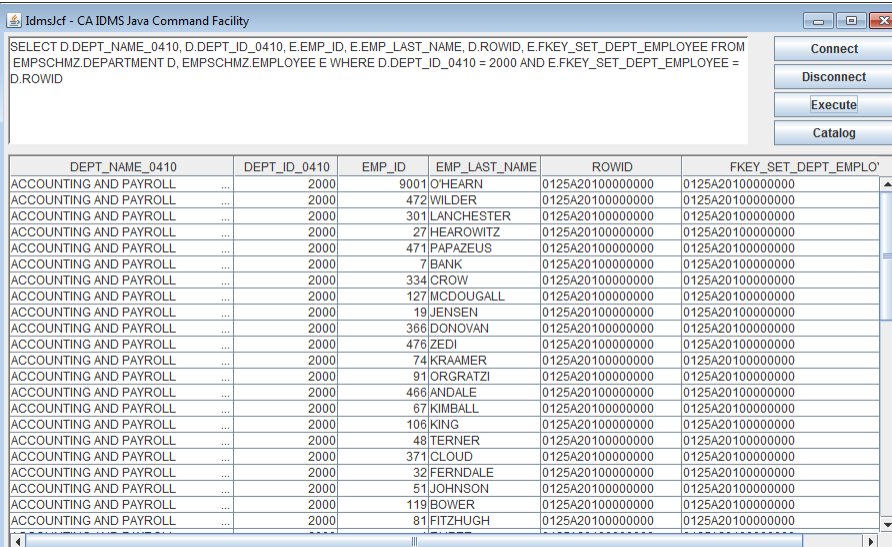
**IdmsJcf - CA IDMS Java Command Facility**

TABLE_CAT	TABLE_SCHEM	TABLE_NAME	TABLE_TYPE	REMARKS	TYPE
<null>	EMPSCHMZ	COVERAGE	VIEW	<null>	<null>
<null>	EMPSCHMZ	DENTAL-CLAIM	VIEW	<null>	<null>
<null>	EMPSCHMZ	DEPARTMENT	VIEW	<null>	<null>
<null>	EMPSCHMZ	EMPLOYEE	VIEW	<null>	<null>
<null>	EMPSCHMZ	EMPPOSITION	VIEW	<null>	<null>
<null>	EMPSCHMZ	EXPERTISE	VIEW	<null>	<null>
<null>	EMPSCHMZ	HOSPITAL-CLAIM	VIEW	<null>	<null>
<null>	EMPSCHMZ	INSURANCE-PLAN	VIEW	<null>	<null>
<null>	EMPSCHMZ	JOB	VIEW	<null>	<null>
<null>	EMPSCHMZ	NON-HOSP-CLAIM	VIEW	<null>	<null>
<null>	EMPSCHMZ	OFFICE	VIEW	<null>	<null>
<null>	EMPSCHMZ	SKILL	VIEW	<null>	<null>
<null>	EMPSCHMZ	STRUCTURE	VIEW	<null>	<null>

**IdmsJcf - Catalog DatabaseMetaData**

Schema Pattern: EMPSCHMZ  
 Table Pattern: %  
 Column Pattern: %  
 Foreign Key Schema:   
 Foreign Key Table:   
 Select Query: Tables

## Tools – Java JCF



**IdmsJcf - CA IDMS Java Command Facility**

SELECT D.DEPT\_NAME\_0410, D.DEPT\_ID\_0410, E.EMP\_ID, E.EMP\_LAST\_NAME, D.ROWID, E.FKEY\_SET\_DEPT\_EMPLOYEE FROM EMPSCHMZ.DEPARTMENT D, EMPSCHMZ.EMPLOYEE E WHERE D.DEPT\_ID\_0410 = 2000 AND E.FKEY\_SET\_DEPT\_EMPLOYEE = D.ROWID

DEPT_NAME_0410	DEPT_ID_0410	EMP_ID	EMP_LAST_NAME	ROWID	FKEY_SET_DEPT_EMPLO'
ACCOUNTING AND PAYROLL	2000	9001	O'HEARN	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	472	WILDER	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	301	LANCHESTER	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	27	HEAROWITZ	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	471	PAPAZEUS	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	7	BANK	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	334	CROW	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	127	MCDUGALL	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	19	JENSEN	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	366	DONOVAN	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	476	ZEDI	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	74	KRAAMER	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	91	ORGRATZI	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	466	ANDALE	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	67	KIMBALL	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	106	KING	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	48	TERNER	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	371	CLOUD	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	32	FERNDAL	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	51	JOHNSON	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	119	BOWER	0125A20100000000	0125A20100000000
ACCOUNTING AND PAYROLL	2000	81	FITZHUGH	0125A20100000000	0125A20100000000

## Tools – Java Hibernate mappings


**All Entities**

**Packages**

**All Entities**

- Coverage
- CoverageId
- DentalClaim
- DentalClaimId
- Department
- DepartmentId
- Employee
- EmployeeId
- Emposition
- EmpositionId
- Expertise
- ExpertiseId
- HospitalClaim
- HospitalClaimId
- InsurancePlan
- InsurancePlanId
- Job
- JobId
- NonHospClaim
- NonHospClaimId
- Office
- OfficeId
- Skill
- SkillId
- Structure
- StructureId

**Tables Entities**




demo

**Entity Employee**


demo.Employee

Identifier Summary			
Name	Column	Type	Description
empId	EMP_ID	short	
empFirstName	EMP_FIRST_NAME	String	
empLastName	EMP_LAST_NAME	String	
empStreet	EMP_STREET	String	
empCity	EMP_CITY	String	
empState	EMP_STATE	String	
empZipFirstFive	EMP_ZIP_FIRST_FIVE	String	
empZipLastFour	EMP_ZIP_LAST_FOUR	String	
empPhone	EMP_PHONE	long	
status	STATUS	String	
ssNumber	SS_NUMBER	int	
startYear	START_YEAR	byte	
startMonth	START_MONTH	byte	
startDay	START_DAY	byte	
terminationYear	TERMINATION_YEAR	byte	
terminationMonth	TERMINATION_MONTH	byte	
terminationDay	TERMINATION_DAY	byte	
birthYear	BIRTH_YEAR	byte	
birthMonth	BIRTH_MONTH	byte	
birthDay	BIRTH_DAY	byte	
rowId	ROWID	byte[]	
fkeySetOfficeEmployee	FKEY_SET_OFFICE_EMPLOYEE	byte[]	
fkeySetDeptEmployee	FKEY_SET_DEPT_EMPLOYEE	byte[]	



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Want to see examples with your database?

- Join the **CA IDMS 19.0 Customer Validation program**

- See [validate.ca.com](http://validate.ca.com)



- Send us your samples ...

- A network record
  - Diagram
  - Record description
  - Sets (as a member)



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## Q&A



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