Configuring Access controls in the OS/390 and z/OS LDAP Server (Vanguard Session 72)

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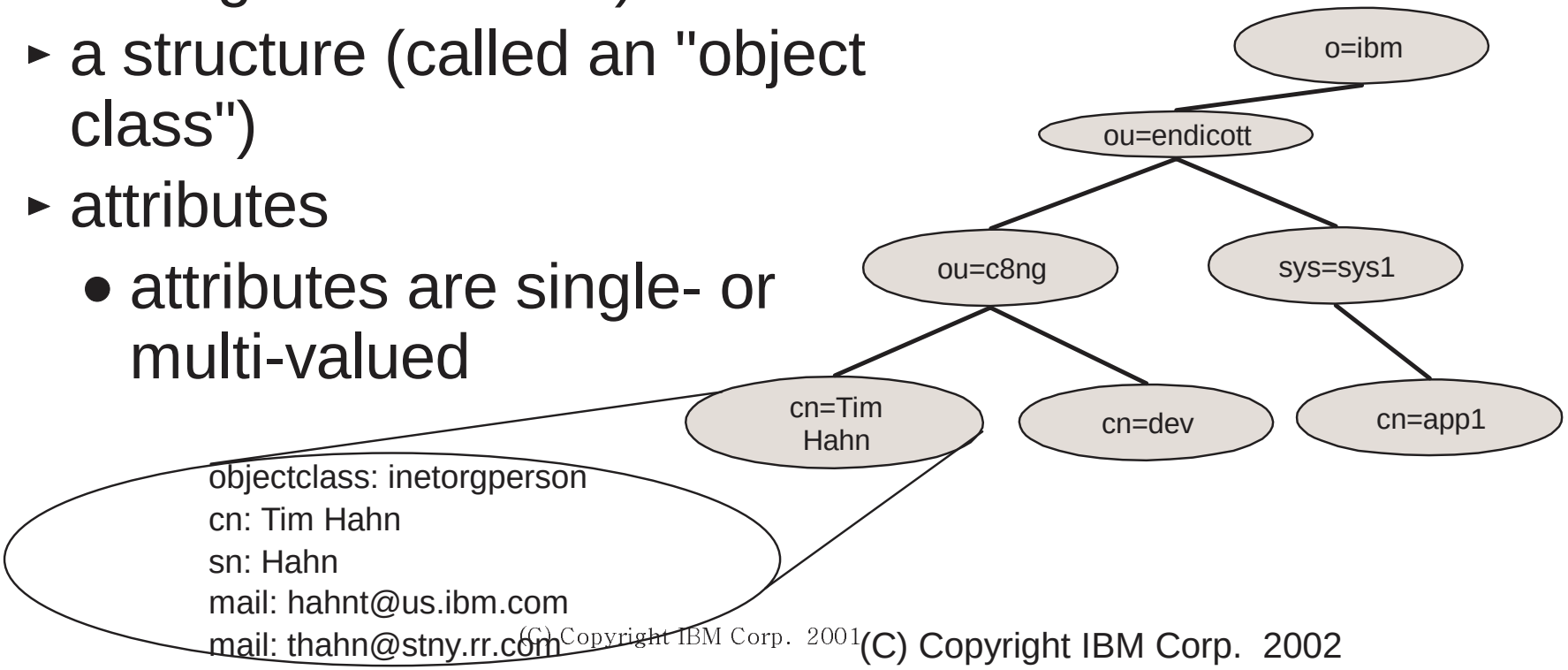
What are we going to talk about?

- Directory Information model
  - Hierarchy of entries
  - Object classes
  - Attributes
- OS/390 LDAP Access Control model
  - Data elements
  - Check Algorithm and precedence
  - Usage
  - Examples
  - Differences between Server Releases

Directory Information Model

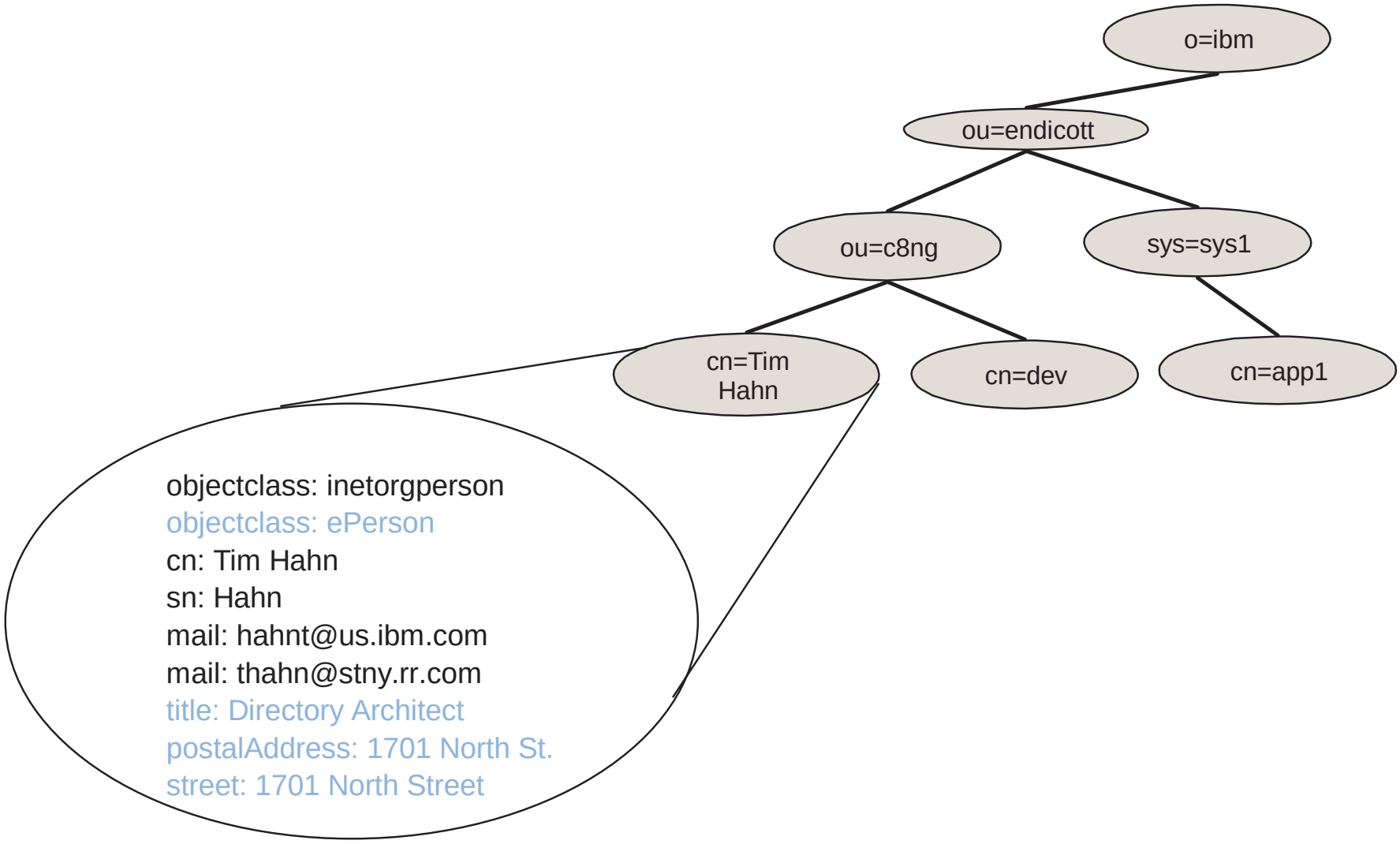
- An LDAP Directory is formed by a hierarchy of "entries"
- Each "entry" has:
  - a name (called a distinguished name)
  - a structure (called an "object class")
  - attributes
    - attributes are single- or multi-valued



Directory Information Model

- An Entry's "object class" defines
  - structure of an entry
  - attributes that MUST be present in an entry
  - attributes that MAY be present in an entry
- An individual Entry in the directory can take on the form of multiple object classes
  - The attributes in the entry are the UNION of those defined for individual object classes

Directory Information Model

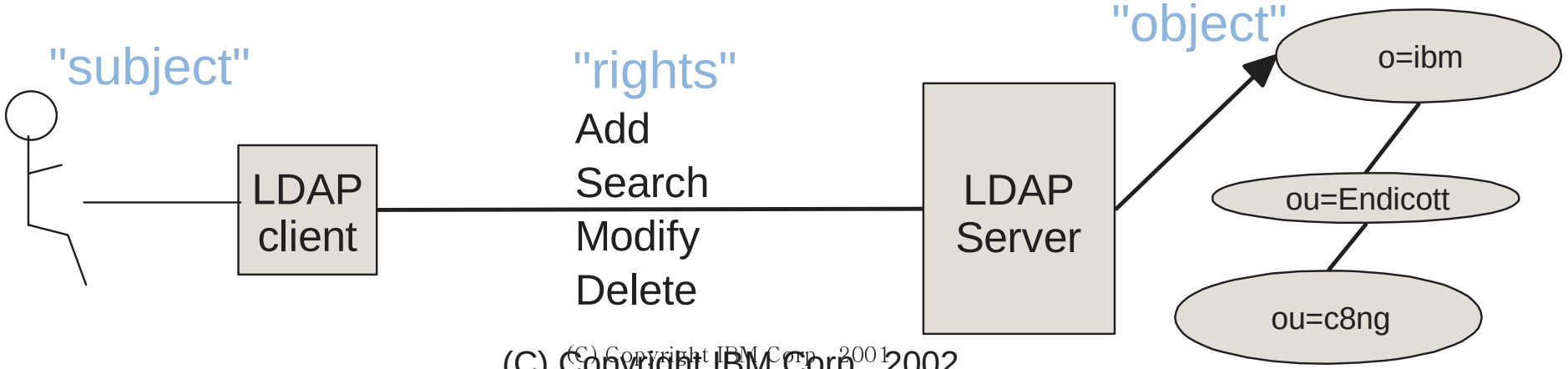


Directory Information Model

- Attributes are defined by their name, syntax, and matching rule(s)
  - Syntax refers to the type of data stored in attribute values
    - Examples: directoryString, binary, integer
  - Matching Rules define how equality and ordering comparisons are performed on attribute values
    - Examples: caseIgnoreMatch, caseExactMatch, octetStringMatch
- Different attributes within an entry may be more "sensitive" than others within an entry
  - Example: common name (cn) vs. uid vs. userPassword

Access Control of Directory Content

- The access control model for a directory must
  - treat the "subject" of the access control check as the identity/group set of the "bound" LDAP client
  - treat the "object" of the access control check as the entry (or attributes within an entry) in the directory tree
  - determine the set of "rights" required in order to perform any given LDAP operation
  - Check to see if the "subject" can access the "object", with the required "rights"



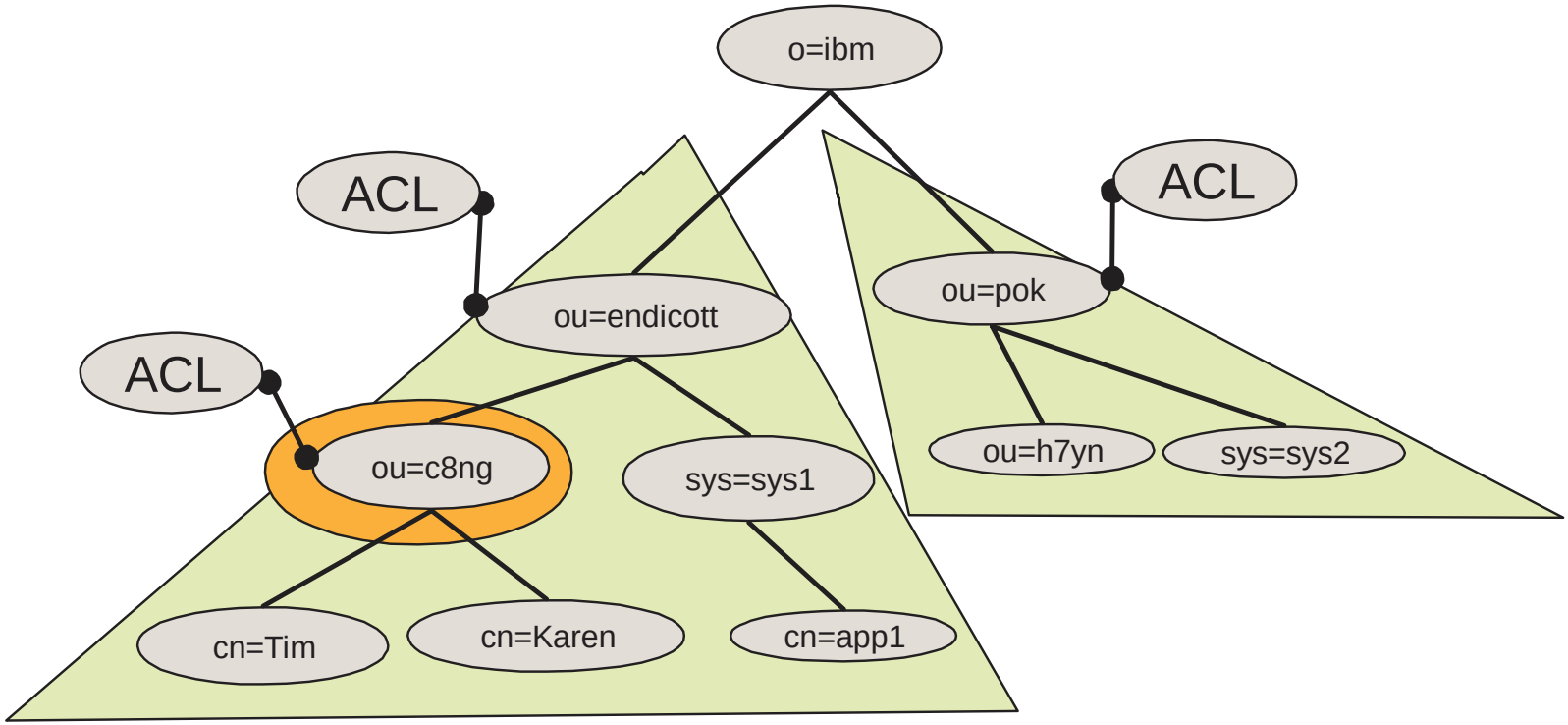
Access Control Implementation

- Provides "near" attribute-level granularity of permissions
  - attributes are "grouped" by "access class"
  - normal, sensitive, critical
  - the access class for an attribute is defined with extensions to the schema for the attribute
- "subject" is defined using distinguished names (in accordance to LDAP BIND protocol operations)
- "object" is defined in terms of entry name and attribute "access class" (normal, sensitive, critical, restricted, system)
- "rights" defined as read (r), write (w), search (s), compare (c)

Access Control Implementation

- Access control can be defined in one entry and made to apply to all entries below the entry (until overridden by another ACL definition)
- Each entry also has an "entry owner" which has complete access to the entry
- Entry owner can also be made to apply "down the tree"
- All access control information is viewable and updateable as additional attributes in an entry

Access Control Implementation



Access Control Attributes

- Access control is defined with directory attributes attached to entries in the directory
  - aclEntry
  - aclPropagate
  - aclSource
  - entryOwner
  - ownerPropagate
  - ownerSource
- aclSource and ownerSource are read-only attributes
  - calculated by the backend
  - never specified when defining ACLs

ACL Attributes

- aclEntry
  - Defines specific permissions for specific people or groups
  - Used if entryOwner does not apply
  - Format:
    - [access-id:|group:|role:]distinguishedName \ [<:normal:|:sensitive:|:critical:|:object:>permissions]*
    - permissions are [r|w|s|c]* or [a|d]* for :object:
  - Example:
    - aclEntry: cn=Tim, ou=c8ng, ou=Endicott, o=IBM:normal:rwsc:sensitive:rsc
    - aclEntry: cn=Karen, ou=c8ng, ou=Endicott, o=IBM:object:ad:normal:rwsc

ACL Attributes

- aclPropagate
  - single-valued attribute and defines if the aclEntry applies to only the entry or to the entry and the sub-tree of entries below the entry
  - format
    - TRUE|FALSE
    - Example:
      - aclPropagate: TRUE

Owner Attributes

- entryOwner
  - multi-valued attribute and defines the names of people or groups that are deemed "owners" of an entry (or sub-tree).
  - An owner has complete control of the entry, including changing the ACL
  - format:
    - [access-id:|group:|role:]distinguishedName
    - Example:
      - entryOwner: cn=Tim, ou=c8ng, ou=Endicott, o=IBM

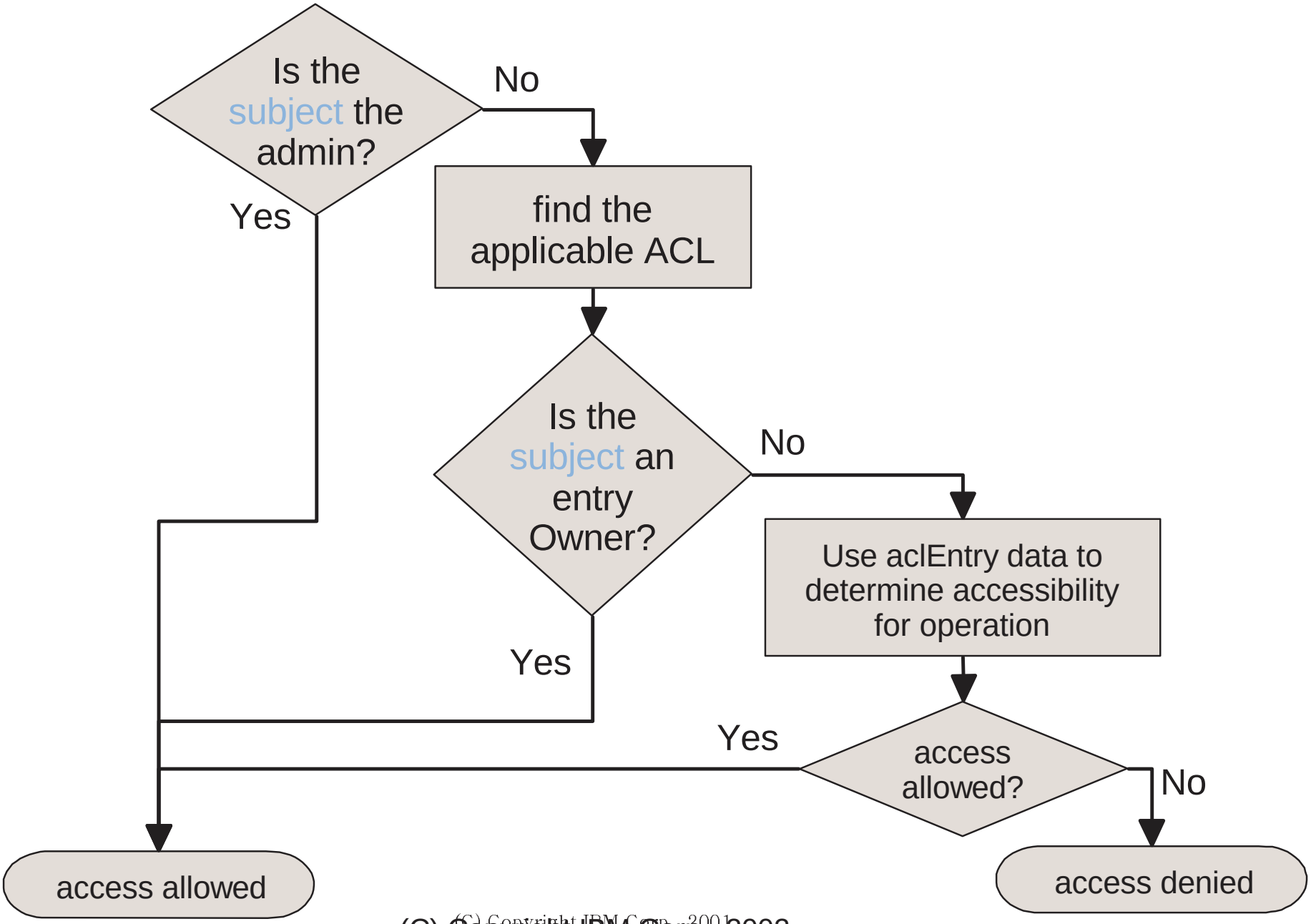
Owner Attributes

- ownerPropagate
  - single-valued attribute and defines if the entryOwner applies to only the entry or to the entry and the sub-tree of entries below the entry
  - format
    - TRUE|FALSE
    - Example:
      - ownerPropagate: TRUE

Special aclEntry "pseudo-DNs"

- cn=anybody
  - this is used when no specific ACL entry applies
- cn=authenticated (OS/390 R10 and later, SecureWay V3.1+)
  - this is used if the person has authenticated to the directory but no specific ACL entry applies
  - meant to allow more access than cn=anybody ACL entry
- cn=this (OS/390 R10 and later, SecureWay V3.1+)
  - this is used if the person has authenticated with the same name as the entry being accessed
  - used to grant individuals access to private attributes using a single ACL that applies to a sub-tree

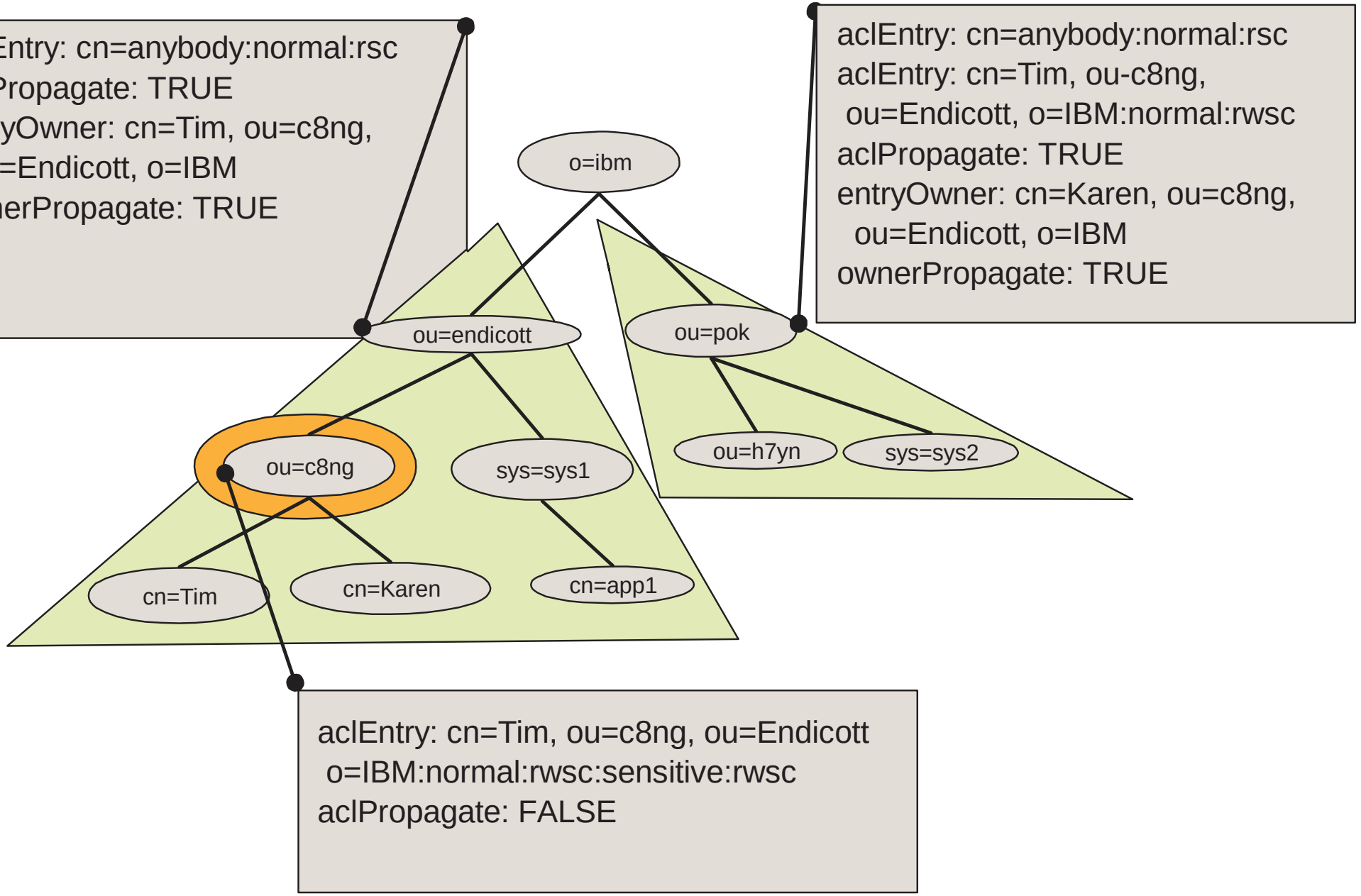
ACL Checking Algorithm



ACL Entry precedence

- more specific aclEntry values have higher precedence
- group and role type aclEntry values have their permissions unioned together
- precedence:
  - value specific to a bound user (including cn=this)
  - set of applicable group and role ACL entries
  - cn=authenticated
  - cn=anybody

Access Control Example



Creating and Modifying ACLs

- Use the ldapmodify command to modify ACLs
  - Accepts input in the form of LDIF files
  - edit a file to contain the modification
  - run the ldapmodify command with -f <filename>
- Individual ACL entries can be added and removed

ACL modify Example

- Command:

```
$ ldapmodify -h localhost \
 -D "cn=Tim, ou=c8ng, ou=Endicott, o=IBM" \
 -w XXXXX \
 -f aclmods.ldif
```

- aclmods.ldif file:

```
dn: ou=Endicott, o=IBM
changetype: modify
add: aclEntry
aclEntry: cn=Karen, ou=c8ng, ou=Endicott,
 o=IBM:normal:rwsc
aclEntry: cn=this:normal:rwsc:sensitive:rwsc:
 critical:rwsc
-
replace: aclPropagate
aclPropagate: TRUE
-
```

Listing ACLs

- Use the ldapsearch command to list ACL information
  - the ACL attributes must be explicitly requested in order to have the ACL information returned
  - ACL attributes are covered under access control checks as well so only users who are allowed to see ACL information can see it

ACL search example

- Command:

```
$ ldapsearch -h localhost \
 -D "cn=Tim, Hahn, ou=Endicott, o=IBM" \
 -w XXXXX \
 -b "ou=Endicott, o=IBM" -s base -L \
 "(objectclass=*)" \
 aclEntry aclPropagate aclSource \
 entryOwner ownerPropagate ownerSource
```

ACL search example *(continued)*

- Command Output:

```
dn: ou=Endicott, o=IBM
aclEntry: cn=Karen, ou=c8ng, ou=Endicott,
 o=IBM:normal:rwsc
aclEntry: cn=this:normal:rwsc:sensitive:rwsc:
 critical:rwsc
aclEntry: cn=anybody:normal:rsc
aclPropagate: TRUE
aclSource: ou=Endicott, o=IBM
entryOwner: cn=Tim, ou=c8ng, ou=Endicott, o=IBM
ownerPropagate: TRUE
ownerSource: ou=Endicott, o=IBM
```

Differences in ACL model by OS/390 Release

- The following ACL features apply only to TDBM in OS/390 R10 and later
  - cn=this
  - cn=authenticated
  - access-id, group, role keywords optional
  - add/modify of individual aclEntry values
  - ACL administration using ldapmodify
- ACL support in RDBM is the same for all OS/390 releases, including OS/390 R10

For More Information

- LDAP RFCs
  - http://sunsite.auc.dk/RFC/rfc/rfc2251.html- rfc2256.html
- z/OS LDAP Documentation
  - SC24-5923-02 z/OS V1R2.0 Security Server LDAP Server Administration and Use
    - http://publibz.boulder.ibm.com/epubs/pdf/glda2a11.pdf
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