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# z/OS XCF Note Pad Usage and Exploitation

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IBM

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## Session Objectives

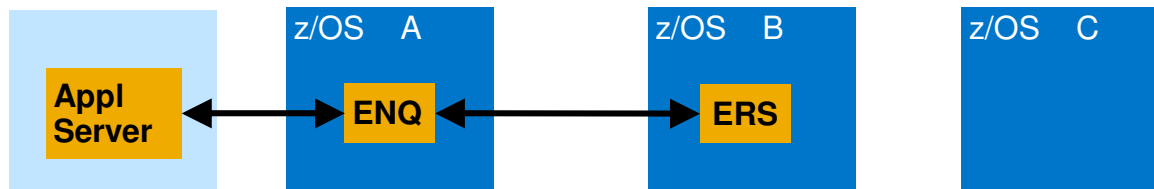
### Describe new XCF Note Pad Services

- Exploitation by SAP
- Key Concepts
- System Programmer Perspective
- Application Programmer Perspective

# SAP Enqueue Server Exploiting Coupling Facility

## Failover Scenarios (1)

> **Today:** complex failover scenario controlled by System Automation; monitoring multiple components plus network



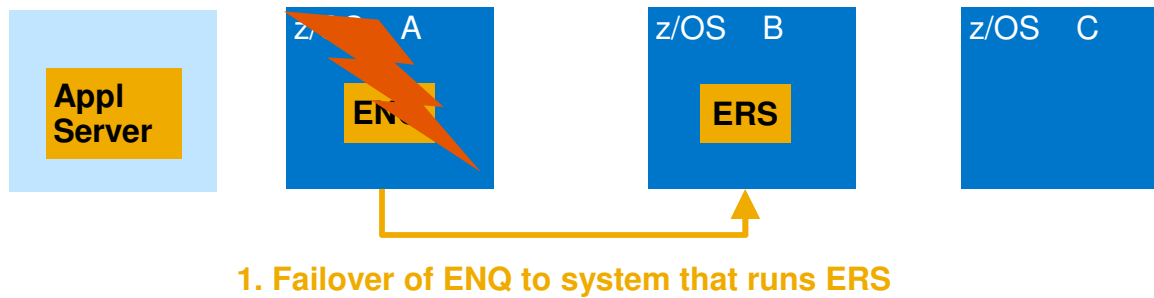
ENQ – SAP Enqueue Server  
ERS – SAP Enqueue Replication Server

(similar to a lock man  
(provides backup copy of lock)

# SAP Enqueue Server Exploiting Coupling Facility

## Failover Scenarios (2)

➤ **Today:** complex failover scenario controlled by System Automation; monitoring multiple components plus network

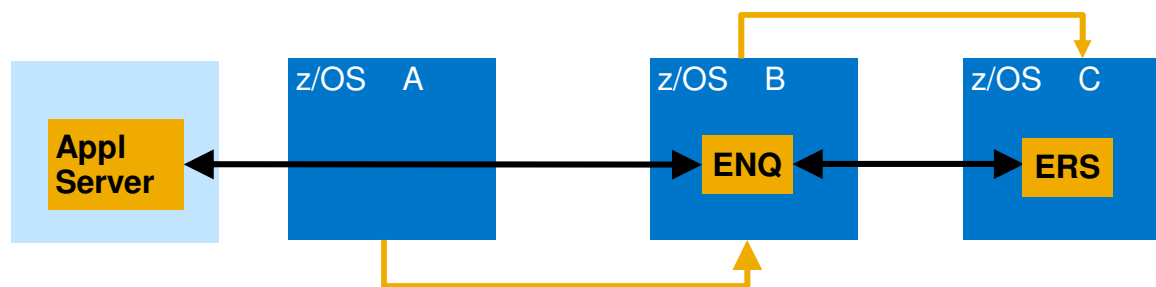


# SAP Enqueue Server Exploiting Coupling Facility

## Failover Scenarios (3)

➤ **Today:** complex failover scenario controlled by System Automation; monitoring multiple components plus network

2. Move ERS to next available system



1. Failover of ENQ to system that runs ERS

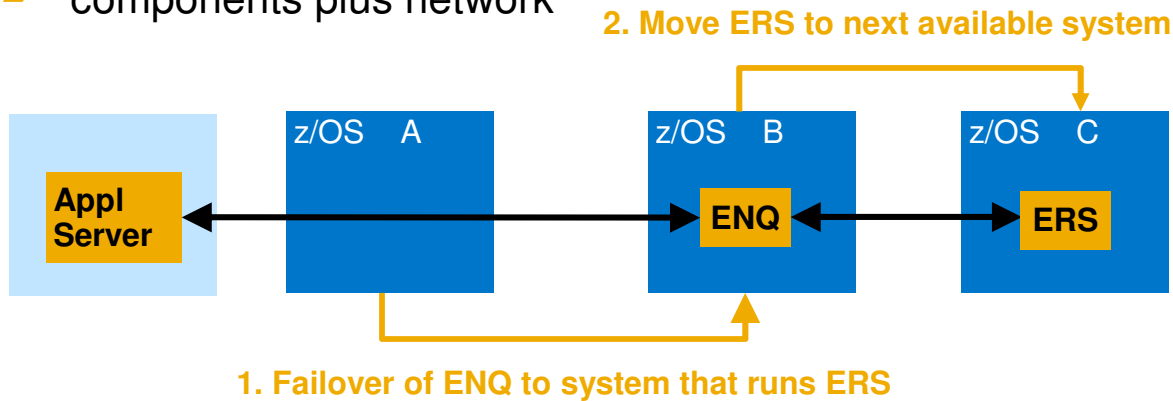
### Automation Policy Rules

- ENQ, MSG, VIPA collocated
- ERS starts after ENQ
- ERS is anti-collocated to ENQ
- start ENQ on ERS system after a failure

# SAP Enqueue Server Exploiting Coupling Facility

## Failover Scenarios (4)

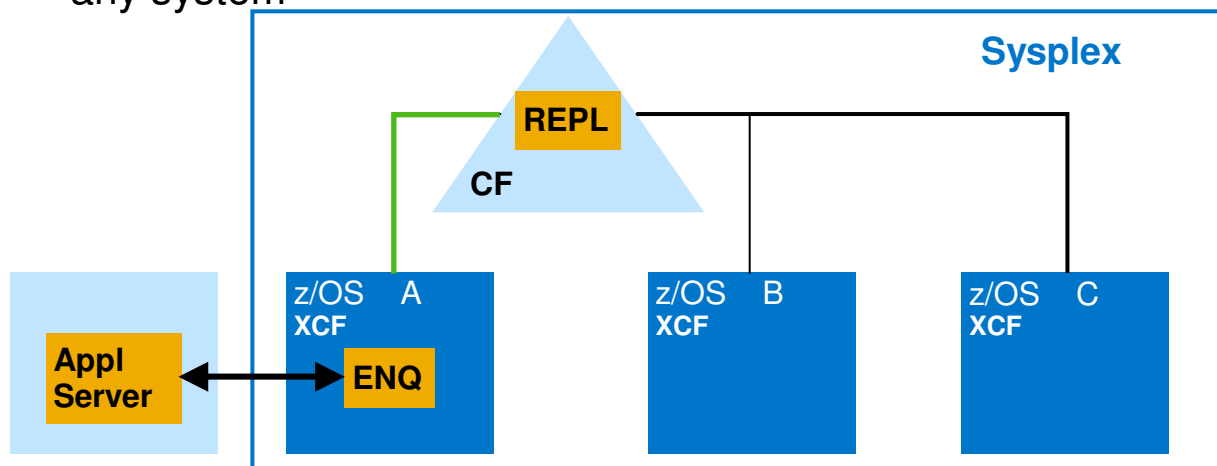
➤ **Today:** complex failover scenario controlled by System Automation; monitoring multiple components plus network



### Automation Policy Rules

- ENQ, MSG, VIPA collocated
- ERS starts after ENQ
- ERS is anti-collocated to ENQ
- start ENQ on ERS system after a failure

➤ **New:** Simplified, bullet-proof configuration using Parallel Sysplex capabilities  
Simple restart in place or failover to any system in the Sysplex; data in CF accessible from any system



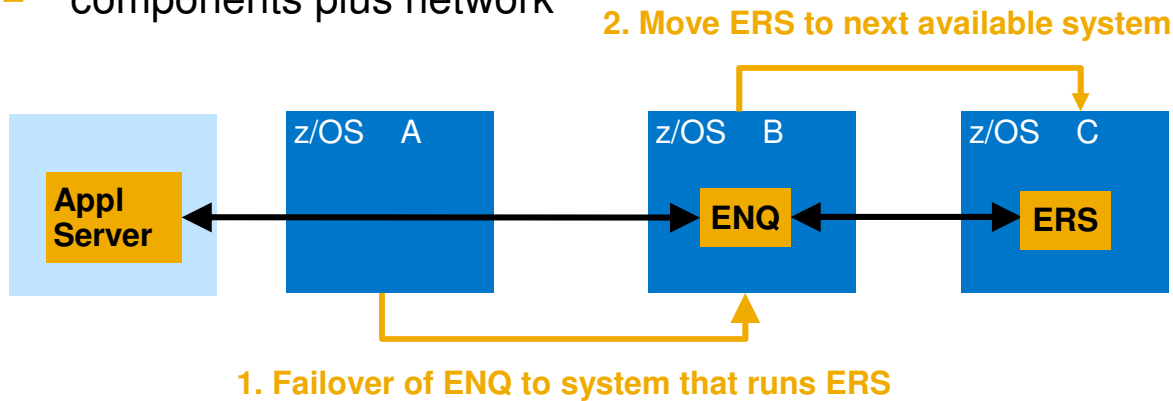
### Automation Policy Rules

- ENQ, MSG, VIPA collocated
- restart ENQ on any system

# SAP Enqueue Server Exploiting Coupling Facility

## Failover Scenarios (5)

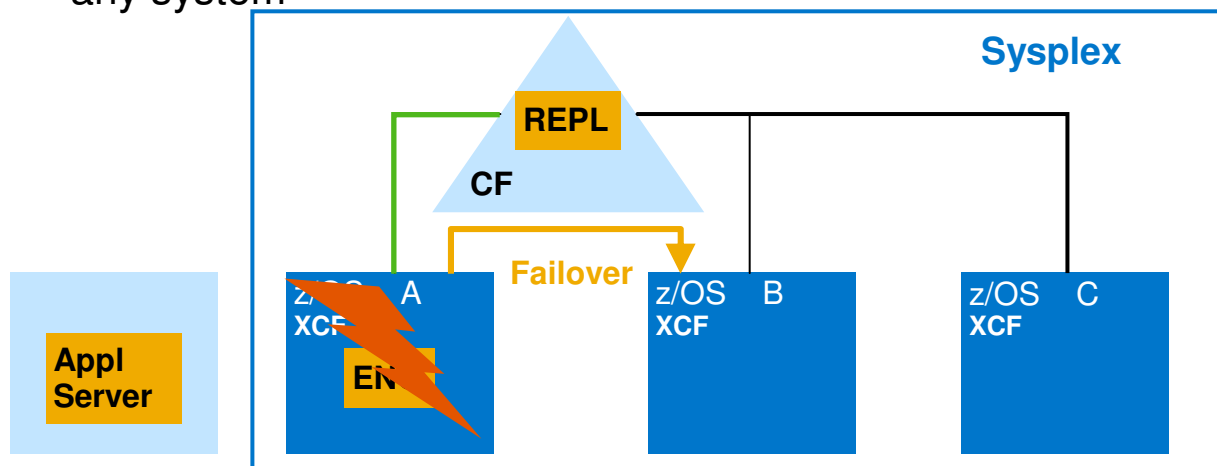
➤ **Today:** complex failover scenario controlled by System Automation; monitoring multiple components plus network



### Automation Policy Rules

- ENQ, MSG, VIPA collocated
- ERS starts after ENQ
- ERS is anti-collocated to ENQ
- start ENQ on ERS system after a failure

➤ **New:** Simplified, bullet-proof configuration using Parallel Sysplex capabilities  
Simple restart in place or failover to any system in the Sysplex; data in CF accessible from any system



### Automation Policy Rules

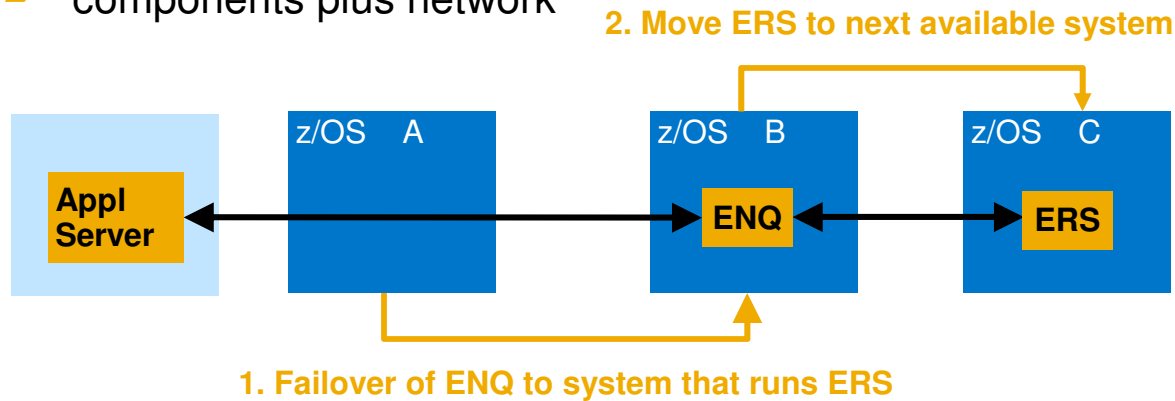
- ENQ, MSG, VIPA collocated
- restart ENQ on any system



# SAP Enqueue Server Exploiting Coupling Facility

## Failover Scenarios (6)

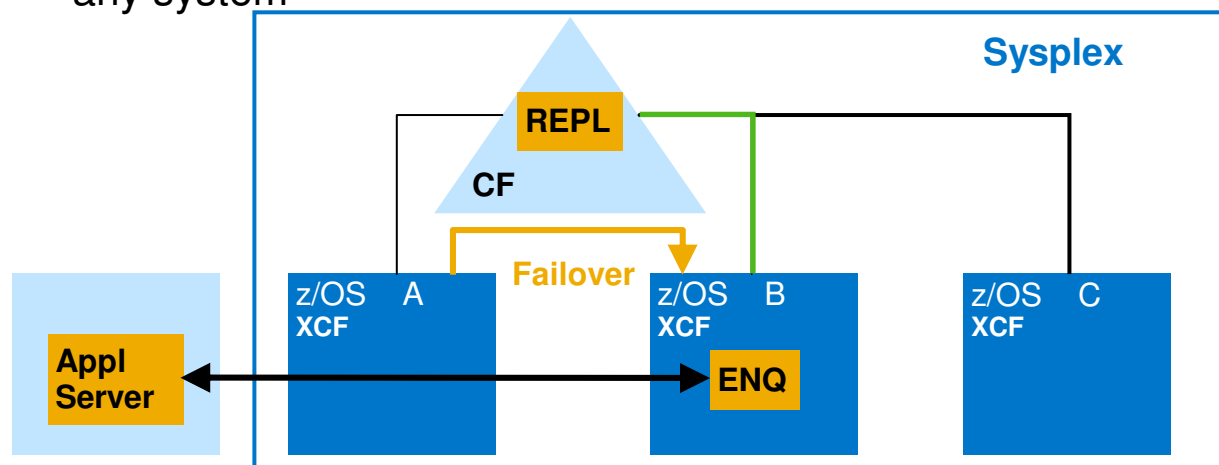
➤ **Today:** complex failover scenario controlled by System Automation; monitoring multiple components plus network



### Automation Policy Rules

- ENQ, MSG, VIPA collocated
- ERS starts after ENQ
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➤ **New:** Simplified, bullet-proof configuration using Parallel Sysplex capabilities  
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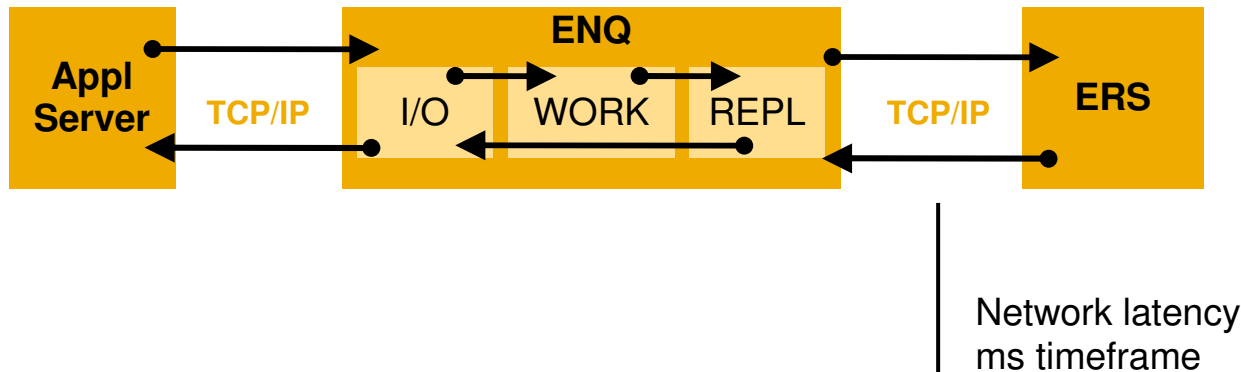
### Automation Policy Rules

- ENQ, MSG, VIPA collocated
- restart ENQ on any system

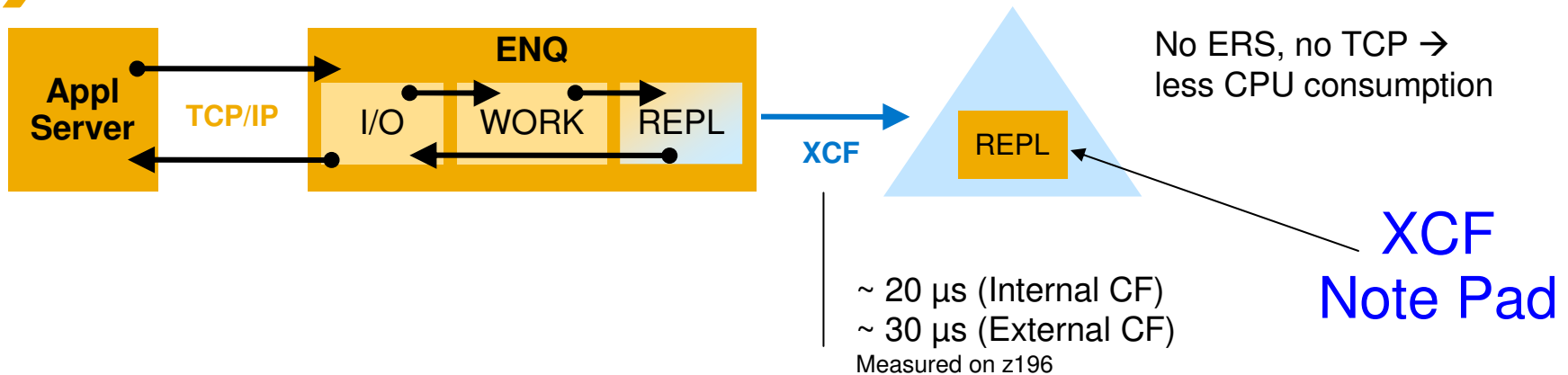
# SAP Enqueue Server Exploiting Coupling Facility

## Implementation Details

### Using Enqueue Replication Server



### Exploiting Coupling Facility



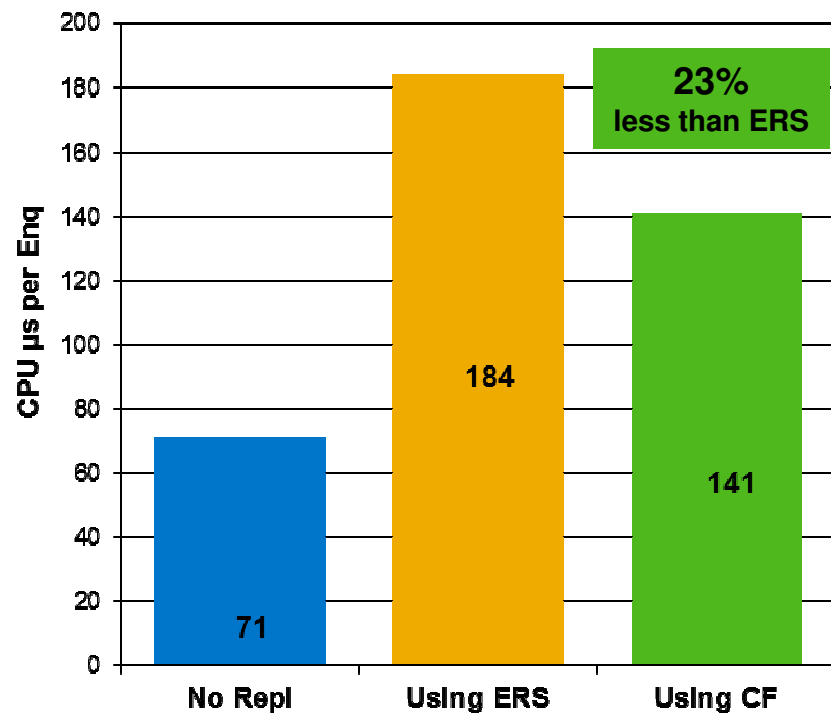
Available on z/OS 1.13 with SAP 7.21 kernel (downward compatible to 7.00, 7.01, 7.10, 7.11)

# SAP Enqueue Server Exploiting Coupling Facility

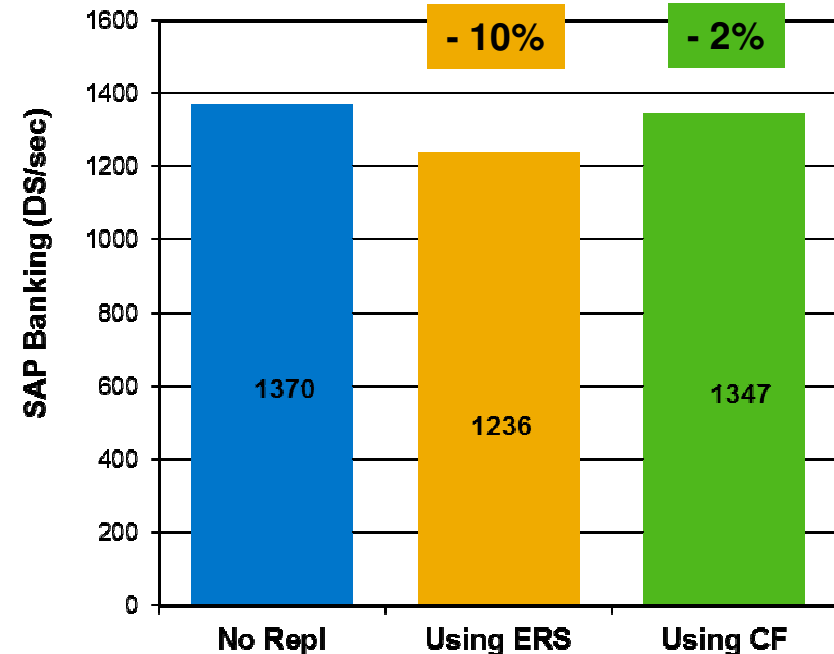
## Performance Measurements & Contact

Measurements with SAP Banking Services 7.0 on 2x z196-26w  
Workload: 34 mio postings/hour, 150 mio accounts

### Enqueue CPU Consumption



### Transaction Rate (DB2 + Enqueue on z/OS)



→ Contact: Rainer Pfister ←  
[rainer.pfister@sap.com](mailto:rainer.pfister@sap.com)

## Motivation

- **Problem Statement / Need Addressed**
  - SAP ENQ Replication Server configuration and fail-over automation is complicated
  - Replication incurs response time degradation
- **Solution**
  - Use XCF Note Pad for replication
- **Benefit / Value**
  - Simplifies configuration
  - More flexible fail-over
  - Less response time degradation when replicating

## Motivation ...

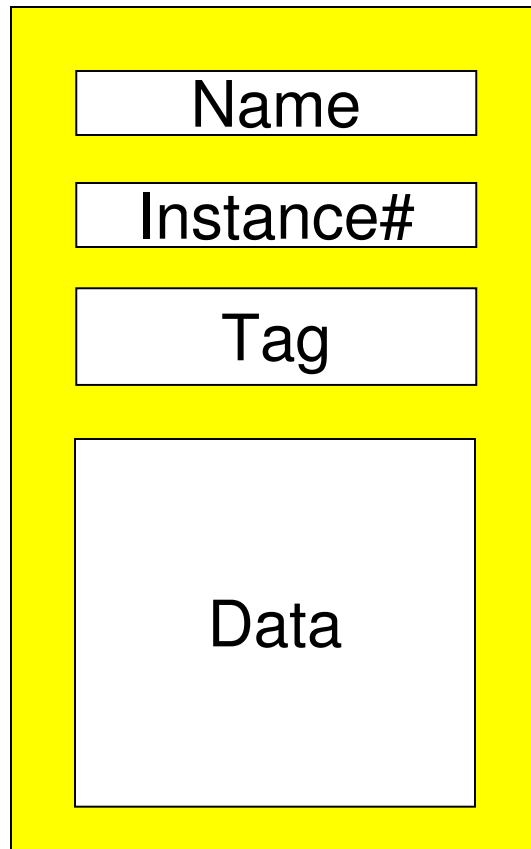
- Problem Statement / Need Addressed
  - Exploitation of Coupling Facility List structure is complex
  - Many exploiters do not want to run authorized
- Solution
  - Exploit XCF Note Pad Services (IXCNOTE macro)
    - Assuming the note pad abstraction fits your needs
- Benefit / Value
  - Note Pads require less coding effort
    - XCF deals with XES events and does failure handling
  - Can be used by unauthorized programs
  - Reduced cost and complexity may make it possible for new sysplex applications to be built

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## Key Concepts

- Note
- Note Pad Abstraction
- Note Pad Connection
- Note Pad Structure
- Note Pad Catalog
- Note Pad Placement

## A Note in an XCF Note Pad

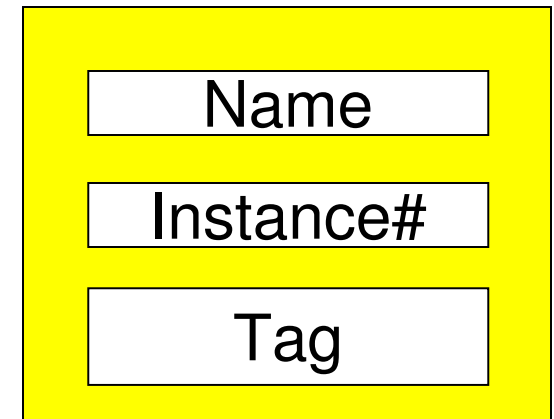


8 byte user note name

8 byte XCF Seq# for C/S

16 bytes of user metadata

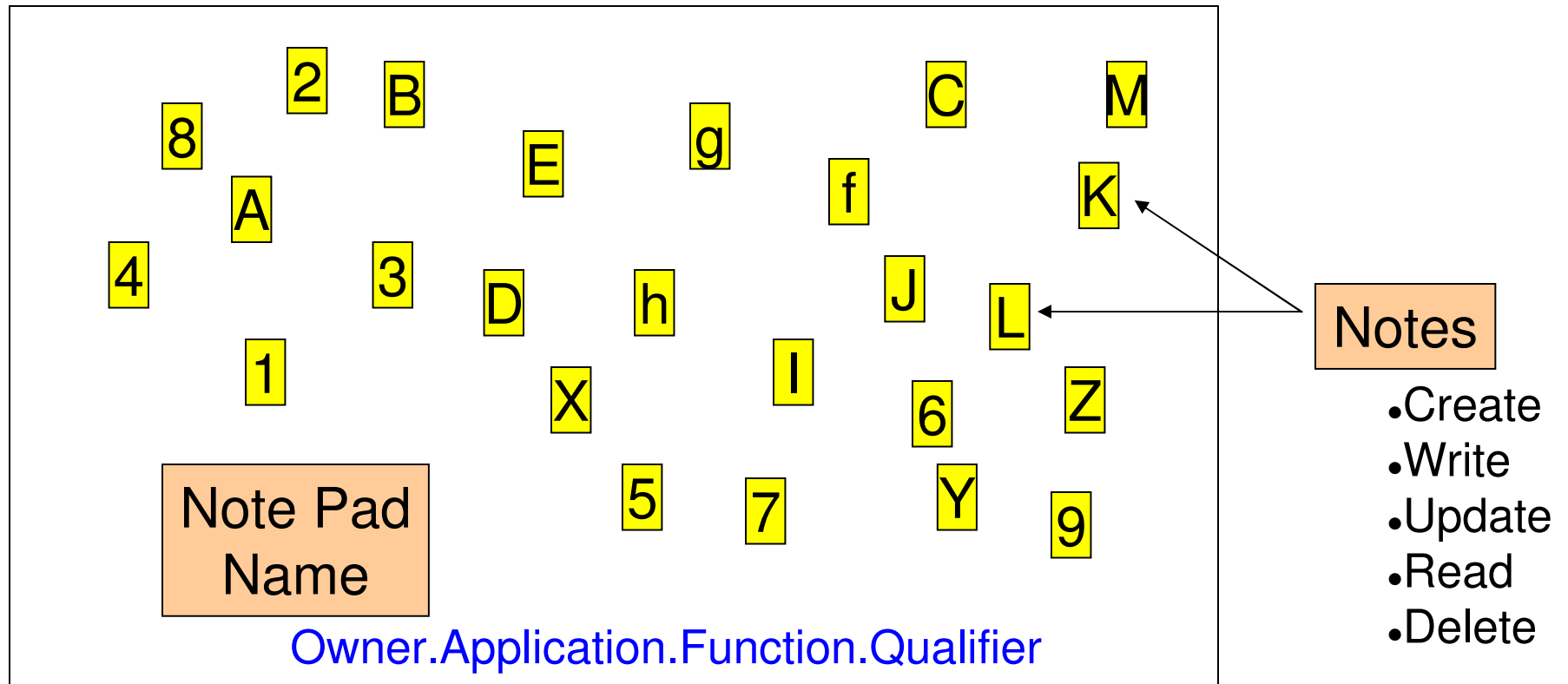
1024 bytes of user data  
(or none)



Note with data

Null note

## Abstract View of an XCF Note Pad



Note Pad

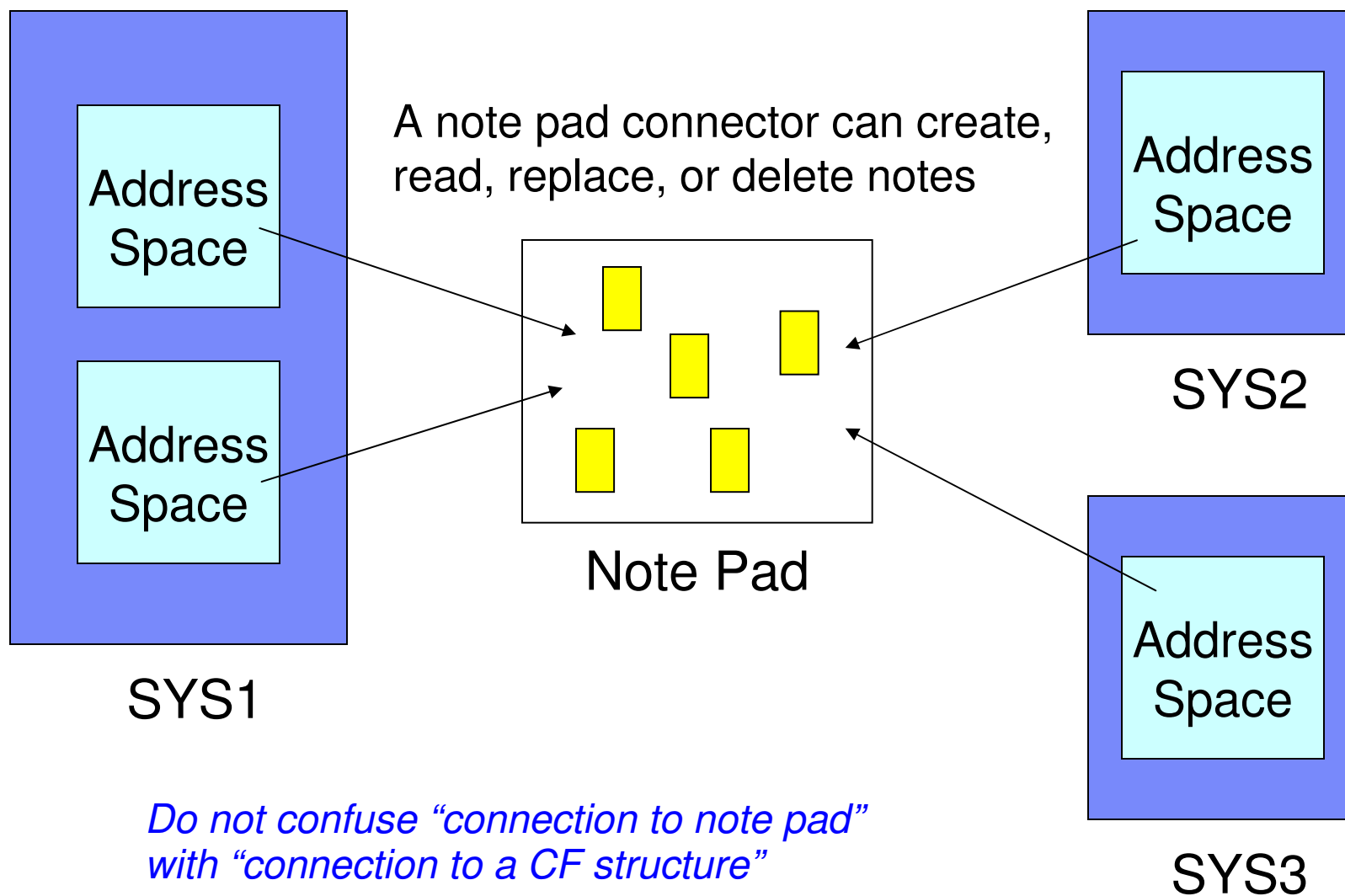
- Create
- Query
- Delete



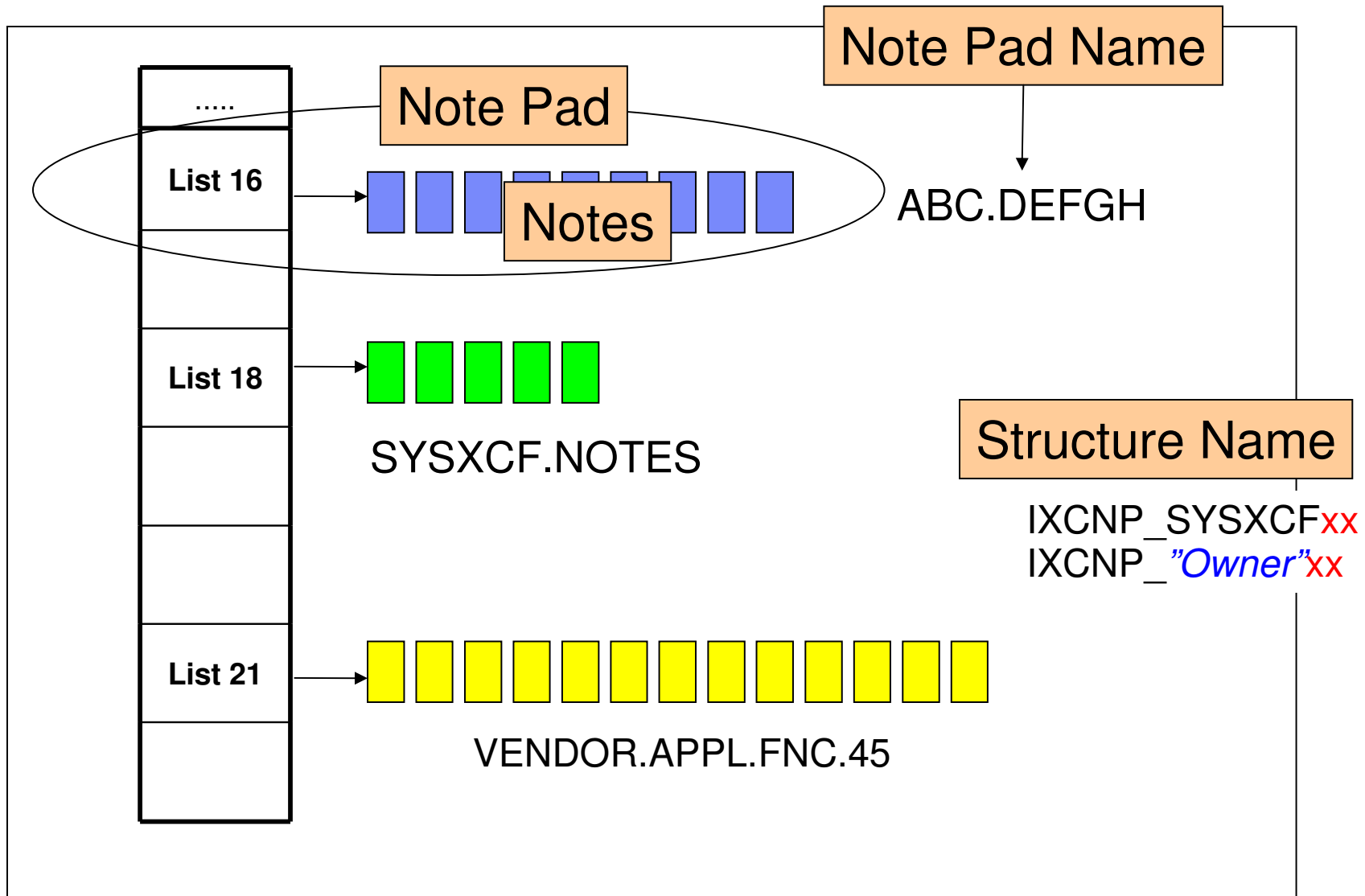
## Note Pad Names

- **Owner.Application.Function.Qualifier**
  - Four 8 byte sections specified by application
  - Each section left justified, blank appended on right
    - Valid characters: A..Z, 0..9, #, \$, @, \_ (underscore)
- **Owner and Application must not be blank**
  - “owner” portion influences choice of host structure
  - “owner.application” determines resource for SAF checks
- **Owner should begin with component or vendor prefix to avoid conflicts between vendors**
  - IBM owner names begin with A..I, or SYS

## Connections to a Note Pad



# XCF Note Pad Structure

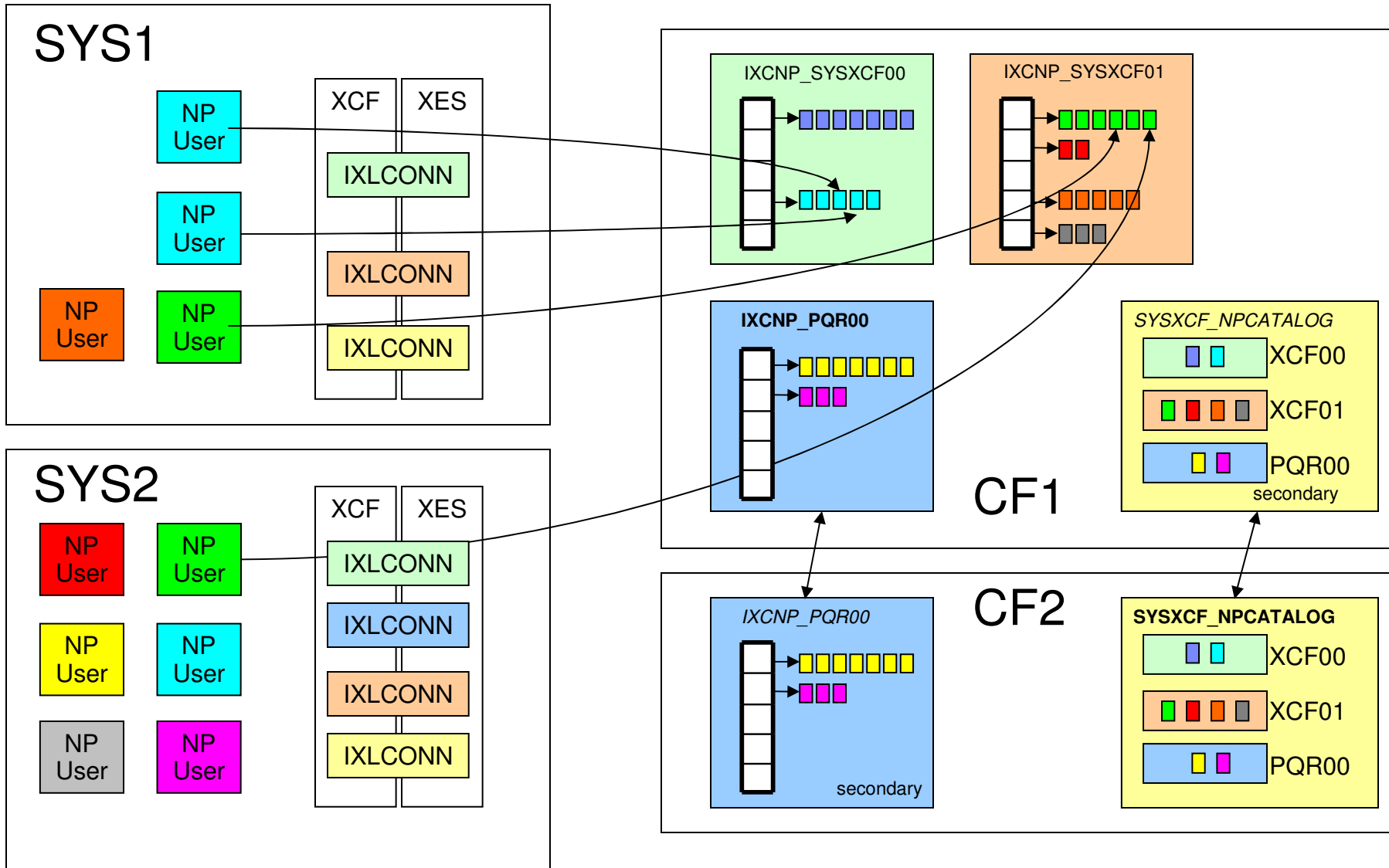


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## Structure Names for Note Pads

- IXCNP\_SYSXCFxx            community structure
- IXCNP\_*owner*xx            owner specific structure
  
- Where “owner” comes from the note pad name
  - owner.application.function.qualifier
- “xx” is EBCDIC representation of hexadecimal number in the range 00..FF
  - allows for multiple note pad structures to be defined

# XCF Note Pads in the Sysplex



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## Note Pad Placement

- Application specifies:
  - Note pad name
  - Desired number of notes
  - Duplexing preference
- Installation defines note pad structure(s) to CFRM:
  - Structure name
  - Structure size
  - DUPLEX( ENABLED | ALLOWED | DISABLED )
  - ALLOWAUTOALT( YES | NO )
- XCF decides where to put the note pad ...

## XCF Selects Host Structure for Note Pad

- Query CFRM policy to see what note pad structures have been defined
- Determine set of structures to be considered, either:
  - Structures with names of the form IXCNP\_Ownerxx, or
  - Structures with names of the form IXCNP\_SYSXCFxx
- Remove any structures that are pending delete
- “Sort” structures according to duplex capabilities and duplex preference stated by application
- Pick first structure with enough space for number of notes requested by application
  - Create note pad fails if none of candidate structures have space

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## Note Pad Stays Put

- Host structure is fixed for the life of the note pad
- XCF does not “move” the note pad in response to CFRM policy changes such as:
  - Defining an “owner” structure
  - Changing the DUPLEX specification for a structure
- Would need to delete the note pad and create it anew to pick up the policy changes



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## System Programmer Perspective

- **Requirements**
  - z/OS 1.13 with APAR OA38450
  - CFLEVEL 9 or later
- **Note Pad Catalog**
  - Size
  - Duplex
- **Note Pad Structure(s)**
  - Names
  - Size
  - Simplex or duplex ?
- **Security**
  - Note pads
  - Structures
- **Management**
  - D XCF, NP
  - Messages
  - Delete Utility
  - Delete Structures
  - Measurement
- **Diagnostics**
  - XCF CTRACE options

---

## Note Pad Catalog

### ■ Function

- Place where XCF keeps track of the note pads
- Single point of failure for XCF Note Pad Services
  - If catalog fails, all note pads fail too
  - If system loses access to catalog, it loses access to all note pads
  - Strongly suggest that catalog structure be duplexed

### ■ Structure Name

- SYSXCF\_NPCATALOG

### ■ Structure size

- Depends on peak number of note pads ever defined at any one time
- Applications need to document need for a note pad

## CFSizer Outputs for SYSXCF\_NPCATALOG

Low..High	#NP	INITSIZE	SIZE
1..123	100	10240	10240
124..269	200	10240	11264
270..287	275	11264	11264
288..447	300	11264	12288
448..610	500	11264	13312
611..772	700	12288	14336
773..898	800	12288	15360

**CFLEVEL=18**

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## Note Pad Structures

- **Function**
  - Host one or more note pads
- **Structure Names**
  - IXCNP\_SYSXCFxx      *community structure*
  - IXCNP\_”owner”xx      *owner specific structure*
  - Conflict with XCF signal structures?
    - Suggest renaming signal structures if so
    - Otherwise whoever gets it first wins
- **Structure Size**
  - At most 1024 note pads per note pad structure
  - Size depends on number of notes needed for the note pads that land in the structure
- **Duplex?**
- **Alter?**

## Owner Specific Structures

- The naming convention provides for a primitive “policy” capability
  - The intent/expectation is for owner specific structures to be used on an exception basis
- Your ability to make effective use of this capability may be limited by application choices
  - The application specifies the note pad “owner”
  - They are encouraged to choose a reasonable default and to provide a mechanism to let the installation override their choice

## CFSizer Outputs for Note Pad Structure

Maximum number of notes <sup>1</sup>	INITSIZE (MB)	SIZE (MB)
1000	13	18
10,000	21	33
100,000	99	185
500,000	444	858
1,000,000	876	1699

**Notes:**

1. This is the sum of all notes from all note pads the note pad structure is expected to host. For example, if the structure is expected to host 50 note pads, with 10,000 notes in each note pad, then the total number of notes that could exist in the structure is 500,000.

**CFLEVEL=18**

## Community vs Owner ?

- I suggest using community structures
- Think of the note pad structures as a warehouse of notes for applications to enjoy from time to time
  - Enough warehouses? note pad structures
  - Enough inventory? notes (structure size)
  - Delivery time? response time (distance, links..)
  - Meets customer needs? duplexed? failure isolated?
- Potential concerns regarding co-location
  - Performance impact?
  - Interference or sympathy sickness between note pads?
  - Compromise resiliency or availability?
- I claim these are non-issues

## Duplexing of Note Pad Structures

- Depends on the application needs
  - SAP prefers that note pad NOT be duplexed
  - Others might prefer yes
- Application must document requirements so that system programmer can accommodate the need through suitable CFRM policy specifications
- Application must indicate preference when creating note pad so XCF can choose a suitable structure
  - But XCF makes no guarantees to application
  - Configuration might not support specified preference
    - We favor finding space over satisfying duplexing preference
    - Even if OK now, configuration/policy could change later



## Security - Note Pad Access

- Requests from unauthorized programs rejected if:
  - SAF not installed, or
  - No SAF profile exists for the note pad, or
  - The profile does not permit the requested access
- Requests from authorized programs rejected if:
  - SAF is installed, and
  - A SAF profile exists for the note pad, and
  - The profile does not permit the requested access
- The Security Administrator needs to know the name of the note pad and the type of access needed by the program in order set up the SAF profile

## SAF Authorization

- FACILITY Class Resource IXCNOTE.owner.application
  - Where “owner” and “application” are derived from the note pad name
- CONTROL access
  - Create or delete a note pad
- UPDATE access
  - Create connection with write access
  - Write notes (when not recognized as valid user)
- READ access
  - Query note pad
  - Create connection with read access
  - Read notes (when not recognized as valid user)

---

## SAF Authorization ...

- Certainly provide necessary authorization for the application
- You may also want to provide authorization for an appropriate administrator to use the delete utility
  - Needs CONTROL access

## Security - Structure Access

- All accesses to note pad related structures should be under XCF control in order to ensure:
  - Integrity of XCF control data
  - Appropriate note pad related SAF checks are made
  - Different note pads within the note pad structure are isolated from each other
- Set up the SAF profiles to ensure that only XCF will be allowed to connect (IXLCONN) to the various note pad related structures (catalog and note pads)
  - Define resource profile IXLSTR.*strname* in the FACILITY class with UACC(NONE) for each of the relevant structures
  - If they can't connect, they can't access the structure

## DISPLAY XCF, NP Command

```
D XCF, { NOTEPAD | NP }  
    [ ,{NOTEPADNAME | NPNAME | NPNM}=notepadname | ALL ]  
    [ ,{STRNAME | STRNM}=hoststrname | ALL ]  
    [ ,SCOPE={SUMMARY | SUM} | {DETAIL | DET}
```

- Get list of note pads that have been defined
- Get detailed information about a note pad
  
- Can filter by note pad name/pattern
- Can filter by CF structure name

Use `D XCF,STR,STRNAME=IXCNP_*` to list note pad structures

## D XCF, NP

```

VMTOOL1
File Edit View Communication Actions Window Help
| SY1 *HZSSTMON: Frames currently in use by Health Checker: 13.652M
- SY1 d xcf,np
*SY1 *HZSSTMON: Frames currently in use by Health Checker: 13.699M
IXC442I 12.42.06 DISPLAY XCF      FRAME LAST  F    E    SYS=SY1
NOTEPAD NAME                      HOST STRUCTURE
SAP.APPL1.CHECKOUT.XCJN$B01       IXCNP_SAP01
SAP.APPL2.CHECKOUT.XCJN$B01       IXCNP_SAP01
SAP.APPL3.CHECKOUT.XCJN$B01       IXCNP_SAP01

IEE612I CN=SY1          DEVNUM=03E0 SYS=SY1          CMDSYS=SY1

IEE163I MODE= R

M# c                                     30/003
Connected to remote server/host vmtool1.pok.ibm.com using port 23
uspok4y-S02-LL-707-Poughkeepsie on uspok4y

```

## D XCF, NP, SCOPE=DETAIL

```

H - XA1_24X80.WS
File Edit View Communication Actions Window Help
-----
Display Filter View Print Options Search Help
-----
SDSF SYSLOG      21.103 SY1  SY1  04/22/2012 3W      899      COLUMNS 52- 131
COMMAND INPUT ==>
SCROLL ==> CSR
0290  D XCF, NP, SCOPE=DET
0000  IXC443I 19.23.19 DISPLAY XCF 261
0000  INFO FOR NOTE PAD FCT.APPL1.CHECKOUT.XCJNM001
0000  DESCRIPTION: NOTEPAD1 DESCRIPTION XCJNM001
0000  HOST STRUCTURE: IXCNP_FCT01
0000  STATUS: CREATED
0000  SYSTEMS CONNECTED: SY1      SY2
0000  CREATED: 04/22/2012 19:22:48.361282
0000  LIST NUMBER: 784
0000  MAX TAG: E200D500C3000000 | S N C |
0000  000000000000000082 | b |
0000  CURRENT NUMBER OF NOTES: 0
0000
0000  NOTE PAD DEFINITION
0000  REQUIRED NUMBER OF NOTES: 20
0000  TAGGING: USER
0000  TRACK TAG: LIFETIME
0000  MULTIWRITE: YES
0000  INFO:
0000  D5D6E3C5D7C1C4F1 | NOTEPAD1 |
0000  40C9D5C6D640E7C3 | INFO XC |
0000  D1D5D4F0F0F14040 | JNM001 |
0000  4040404040404040
0000  4040404040404040
0000  4040404040404040
0000  4040404040404040
0000  4040404040404040
0000  4040404040404040
0000  4040404040404040
0000  4040404040404040
0000
0000  INFO FOR NOTE PAD FCT.APPL2.CHECKOUT.XCJNM001
0000  DESCRIPTION: NOTEPAD2 DESCRIPTION XCJNM001
0000  HOST STRUCTURE: IXCNP_FCT01
0000  STATUS: CREATED
0000  SYSTEMS CONNECTED: SY1      SY2
0000  CREATED: 04/22/2012 19:22:49.701680
0000  LIST NUMBER: 785
0000  MAX TAG: E200D500C3000000 | S N C |
0000  0000000000000000A0 | |
0000  CURRENT NUMBER OF NOTES: 5
0000
0000  F1=HELP      F2=SPLIT      F3=END      F4=RETURN      F5=IFIND      F6=BOOK
0000  F7=UP        F8=DOWN      F9=SWAP     F10=LEFT      F11=RIGHT     F12=RETRIEVE
MA h 10/022

```

## New Messages

- Hardcopy messages to document the create and delete of a note pad
  - IXC471I – Create note pad failed
  - IXC472I – Note pad created
  - IXC473I – Note pad deleted
- Normally the messages are issued by the system that initiated the create/delete note pad request
- But request might complete on a peer system
  - If so, peer issues message
  - Generally arises when originator asks for help because it cannot access the relevant structure



## Delete Note Pad Utility

- **SYS1.SAMPLIB(IXCDELNP)**
- Used to delete a note pad if an application “forgets” to do so
- Under the covers, generates an IXCNOTE request to delete the note pad
  - Note pad deleted even if it contains notes
  - By default, not deleted if note pad has connections
  - Optionally, specify input parameter FORCE to delete the note pad even if it has connections
- Submitter must have appropriate SAF authority for deleting the requested note pad
  - Needs CONTROL access

## Deleting Note Pad Related Structures

- Once created, the structures persist
  - XCF deletes the structures if sysplex re-IPLed
  - XCF deletes a catalog structure if it does not seem to be in sync with the sysplex
  - XCF deletes note pad structure if it does not appear to be in sync with the catalog (or the sysplex)
- Otherwise must be deleted manually (if need be)
  - SETXCF FORCE,STR,STRNAME=strname
- But FORCE rejected if XCF is connected to structure
- Once connected, XCF tends to stay connected
- So the challenge is to get XCF to disconnect ...

## XCF Eventually Disconnects from Structure

- When system has no need to access structure
  - No note pad connectors on local system, and
  - No recent activity (15 minutes)
- For note pad structure, implies system has no note pad connector for any note pad in the structure
- For note pad catalog structure, implies system has no note pad connectors
- Activity occurs as the result of
  - Note pad requests (create, query, delete)
  - D XCF, NP
  - Sysplex partitioning
  - Internal XCF requests from peer systems

## Don't Encourage XCF to Connect

- Use D XCF,STR,STR=strname to see whether XCF is connected to the structure
- But may need to issue D XCF,NP to determine whether there are any note pad connectors
  - Which initiates “activity” that restarts the timer
  - Or worse, causes XCF to establish a new connection
- So when you are driving towards deleting the structure:
  - Issue D XCF,NP from a system that is already connected to the structures of interest
  - Consistently use that same system

## Don't Encourage XCF to Connect ...

- Application activity could cause XCF to establish a connection to the structures
  - For example, a create note pad request
- XCF will not create a note pad in a structure that is pending delete
  - Starting a new CFRM policy that omits the structure will get the structure into a pending delete state
- But to prevent connections to the catalog structure, you will need to ensure that there are no note pad applications running (or starting) in the window while you are waiting for XCF to disconnect

---

## Measurement

- Use existing reports of CF structure activity
- No measurement or reporting on a note pad basis

---

## Application Programmer Perspective

### ■ Note Pad Services

- Create
- Query
- Delete

### ■ Connection Services

- Create
- Pause
- Resume
- Delete

### ■ Note Services

- Single note      create, write, update, read, delete
- Multiple notes    read, delete

New macros:

- IXCNOTE
- IXCYNOTE

---

## Is XCF Note Pad Service Installed?

- Just invoke IXCNOTE, or
- Use IXCQUERY REQINFO=FEATURES  
–QuReqRflxcNoteServiceAvail



## Create Note Pad

```
IXCNOTE REQUEST=NOTEPAD REQTYPE=CREATE
```

- NOTEPAD – name of note pad
- DESCRIPTION – 32 bytes: role, purpose...
- INFO – 64 bytes: up to exploiter
- #NOTES – number notes needed
- MULTIWRITE – YES | NO
- INSTCOMP – REQUIRED | DISCRETIONARY
- TAGGING – XCF | USER
- TRACKTAG – NO | CURRENT | LIFETIME
  - CURRENT and LIFETIME imply TAGs are ordered
- TIMEOUT - seconds to allow for completion

## Note Pad Capacity

- Maximum number of notes specified by creator of note pad
  - Must delete note pad and create anew if want to change value
- Create rejected if XCF cannot find a structure that has enough free space to (logically) allocate the requested number of notes
- Once created, XCF cannot guarantee that the promised number of notes will remain available
  - Alter processing can reduce the size of the structure below what we promise for the application
  - “Constrained” vs “Full”
  - Should be rare, but need to allow for possibility

## Note Pad Persistence

- Once created, the note pad persists until:
  - Explicitly deleted (by application request or delete utility)
  - Fails (structure/CF failure)
  - XCF Note Pad Catalog fails
  - Sysplex goes down
- Application should delete note pad when no longer needed
  - Don't make the installation use the delete utility
  - But if the installation decides to do so, they need to understand:
    - When would it be safe to do so
    - Relevant conditions
    - Potential consequences

---

## Query Note Pad

IXCNOTE REQTYPE=QUERY

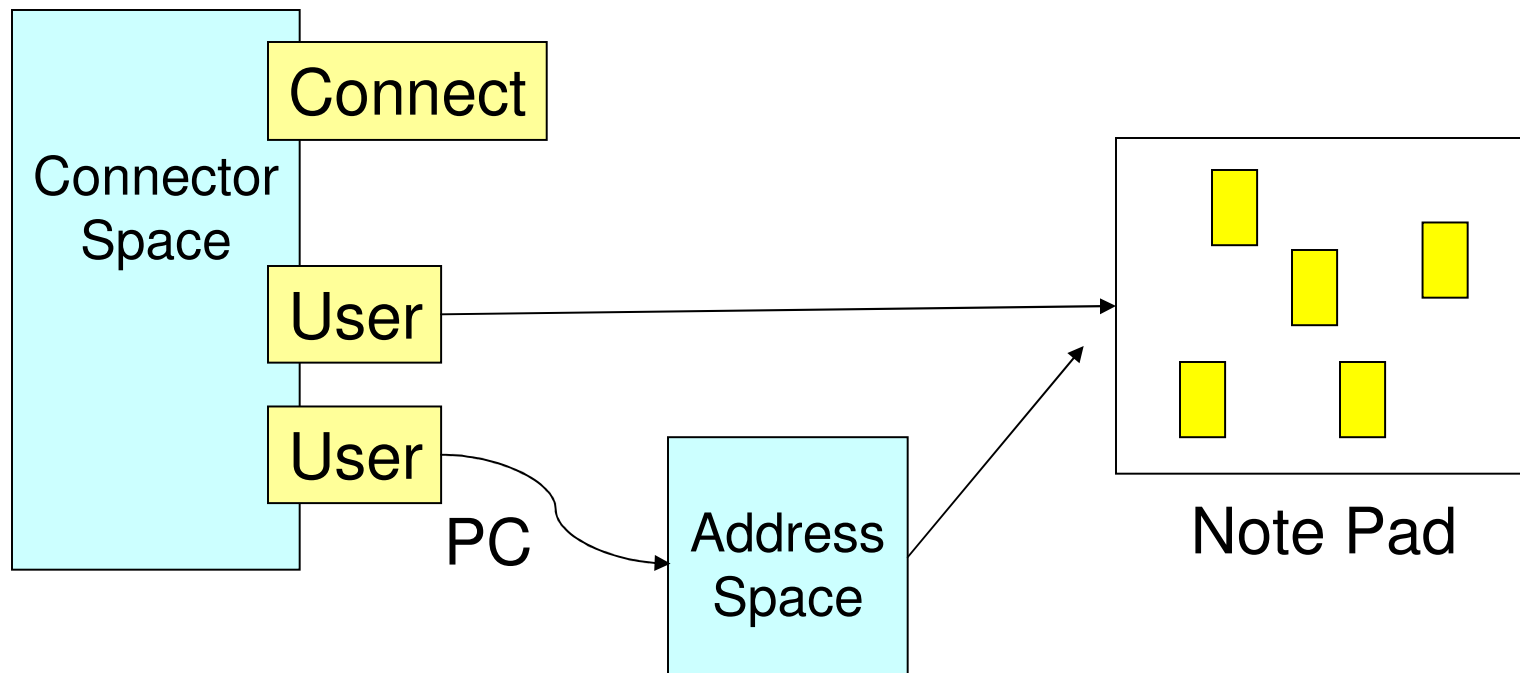
- NOTEPAD - name of note pad
- TIMEOUT - seconds to allow for completion

## Create Note Pad Connection

IXCNOTE REQUEST=CONNECTION REQTYPE=CREATE

- **CONNECTION** – output, connection token
- **NOTEPAD** – name of note pad
- **DESCRIPTION** – 32 bytes: role, purpose...
- **INFO** – 64 bytes: up to exploiter
- **ACCESS:** - UPDATE | READ
- **TERMSCOPE:** - TASK | HOME | PRIMARY
- **USAGE:** - CONNECTOR | SERVER | CLIENT
  - Must run authorized for SERVER | CLIENT
  - Must run authorized for CONNECTOR if not P=H
- **TIMEOUT** - seconds to allow for completion

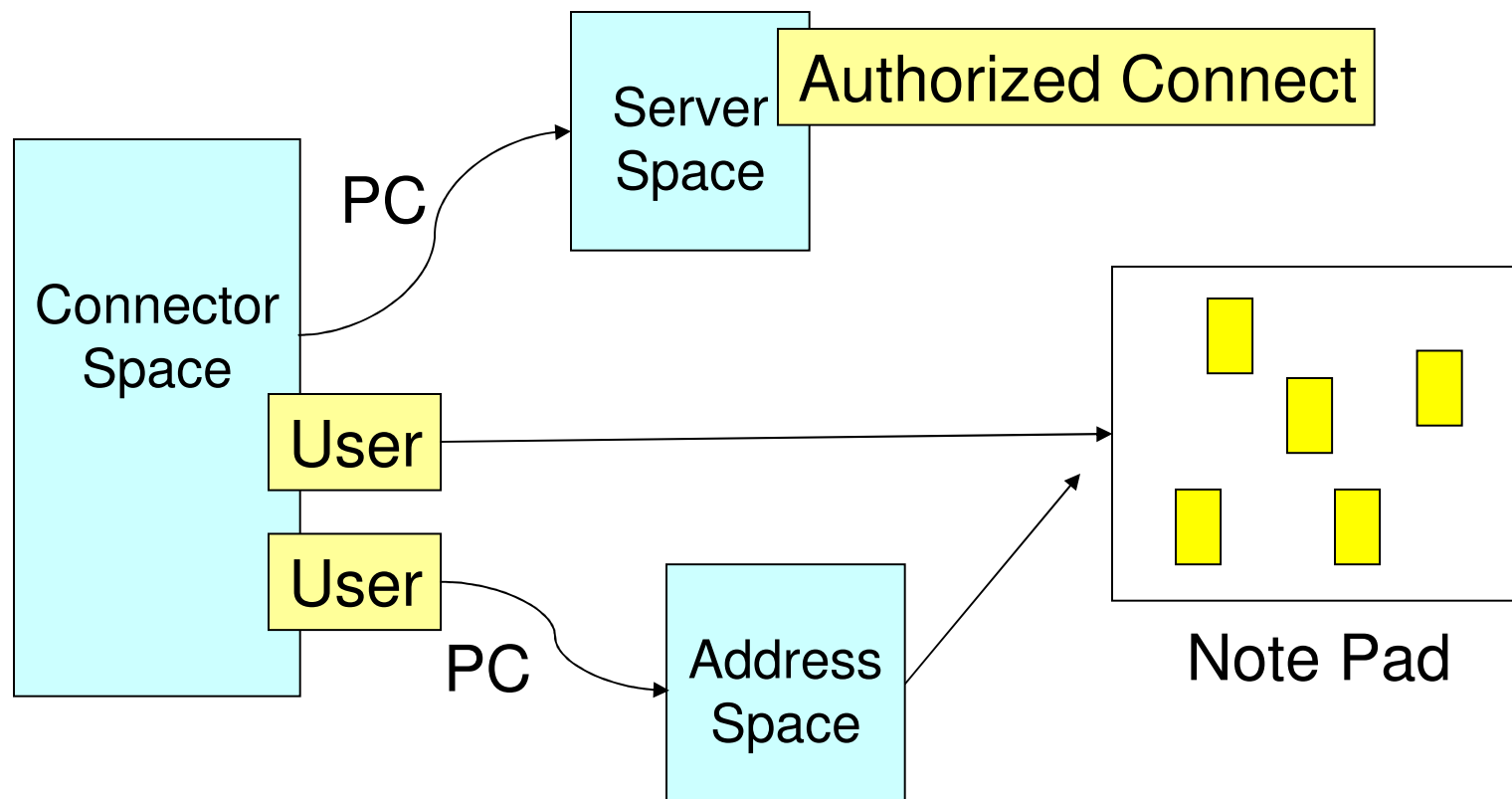
## Usage=Connector



Connection created if SAF permits

Any work unit with home=connector can use connection

## Usage=Connector (authorized creator)

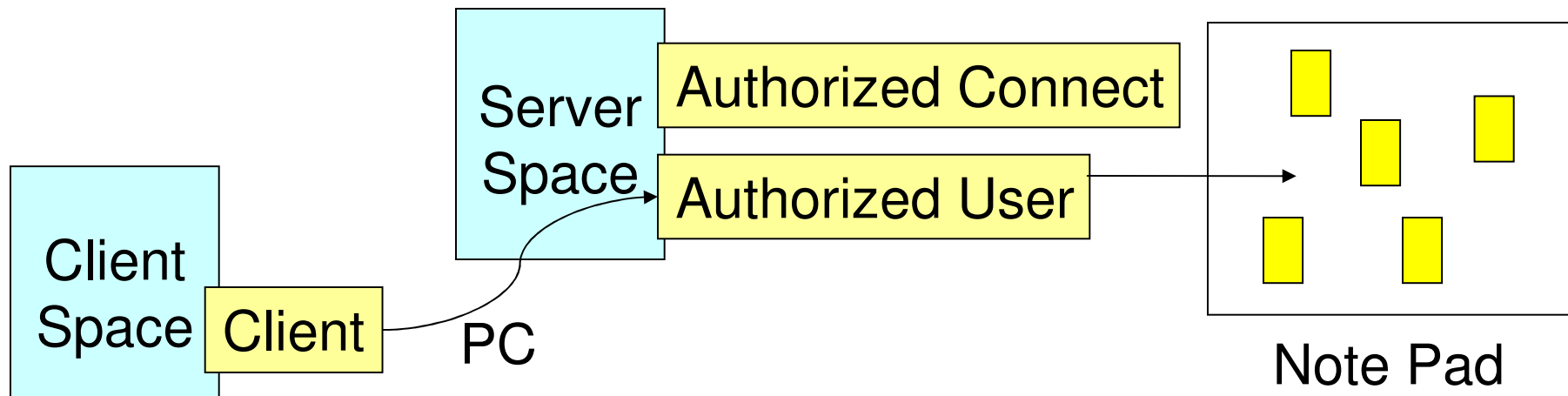


Connection created if SAF permits (connector work unit)

Any work unit with home=connector can use connection

A server can create a connection on behalf of a client, for use by clients

## Usage=Server



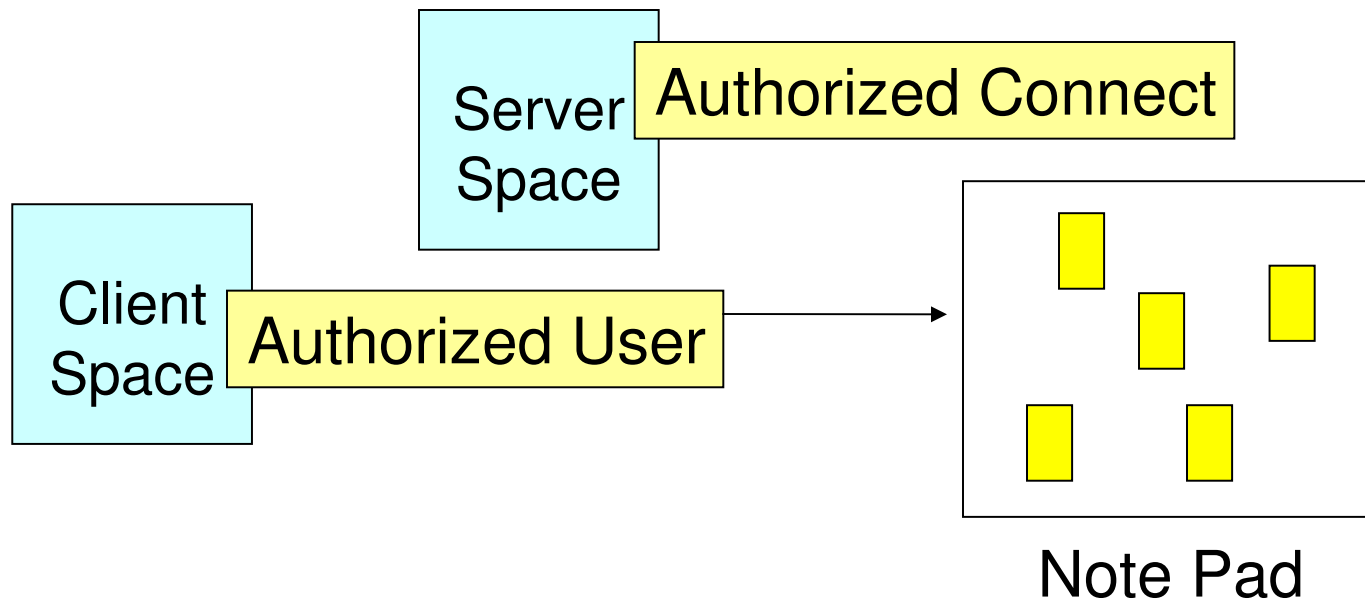
An authorized application creates the connection while running with P=H=Server (must be address space scope).

Any authorized work unit with P=Server can use connection.

Allows server to access its own note pad under client thread running in server space



## Usage=Client



An authorized application creates the connection  
Any authorized application can use the connection

Allows server to access note pad while running in client space

## Process a single note

IXCNOTE REQUEST=NOTE

- CONNECTION – connection token
- REQTYPE – CREATE | WRITE | REPLACE | READ | DELETE
- NAME – 8 byte note name
- TAGGING=USER
  - TAG=value; or TAG=KEEP to keep existing tag (0 if create)
  - If tags are ordered, new TAG must be >= current tag value
- TAGGING=XCF
- INSTANCE#
  - Nonzero value for C/S; zero if unconditional
- KEEPNOTE – YES | NO
- NOBUFFER – store null note or fetch nothing
- BUFFER / BUFLen – store or fetch note data

## Process multiple notes

IXCNOTE REQUEST=NOTES

- **READ** selected notes
  - RESUMETOKEN: zero to start, output from previous read to continue
  - NOBUFFER to omit note data; only get metadata
  - BUFFER / BUFLLEN: where to store note content
  - ANSAREA: metadata to describe notes that were read and where they were stored in BUFFER
- **DELETE** selected notes
  - MAXTAG: value | NONE
  - Only delete selected notes if note TAG is  $\leq$  value
  - If LIFETIME tracking, sets maxtag to indicated value
- **CHOOSE: ALL | BYCRITERIA**

---

## Selecting Notes BYCRITERIA

- Tag Range: select if  $\text{tag} \in [\text{min}, \text{max}]$
- Tag Mask: select if  $(\text{tag} \& \text{mask}) = (\text{filter} \& \text{mask})$
- Connection ID
  - Select based on who last updated the note
    - Anyone | System slot | System ID | Particular connection
  - Select based on KEEPNOTE: YES | NO (or both)

---

## Multi-Note Caveats

- If your application can be processing multi-note requests in parallel with other requests that are manipulating notes in the note pad, you need to be aware of some potential anomalies that can occur:
  - Repeated notes
  - Skipped notes
- See the Sysplex Services Guide which describes the issues in excruciating detail

## Note Pad Quiesced

- All note requests processed as synchronous CF request
- XCF may not be able to process request if:
  - Note pad structure quiesced for rebuild
  - Note Pad still being created
  - Lost connectivity to CF that contains the note pad
- If so, XCF rejects with “note pad quiesced”
- Connector can issue PAUSE request to wait for note pad to become unquiesced
  - Returns when quiesce conditions change or times out

---

## Pause Connection

IXCNOTE REQUEST=CONNECTION REQTYPE=PAUSE

- **CONNECTION** – token for connection to be deleted
- **TIMEOUT** - maximum duration of pause

---

## Resume Connection

IXCNOTE REQUEST=CONNECTION REQTYPE=RESUME

- **CONNECTION** – token for connection to be deleted
- **TIMEOUT** – seconds to allow for completion



## Delete Connection

```
IXCNOTE REQUEST=CONNECTION REQTYPE=DELETE
```

- CONNECTION – token for connection to be deleted
- TIMEOUT – seconds to allow for completion

---

## Connection Also Deleted By XCF

- When TERMSCOPE entity terminates
  - Task or address space designated when connection was created
- When connector address space terminates
- When connector system terminates
- When note pad deleted
- When note pad fails

## When a connection is deleted, XCF:

- Fences the connection so no new note requests can be issued
- Resumes the work unit, if any, that issued IXCNODE REQUEST=PAUSE
- Fences the connection so any in-flight note requests will be rejected by the coupling facility
- Deletes all notes with disposition of KEEP=NO that are associated with the connection
- Updates the XCF Note Pad Catalog (as needed)
  - For example, to allow some other connector to get update access to a note pad created with MULTIWRITE=NO

## Delete Note Pad

`IXCNOTE REQUEST=NOTEPAD REQTYPE=DELETE`

- **NOTEPAD** – name of note pad
- **ETODCREATED** – optionally identify specific instance
- **CONDITIONS=NO** – delete even if has notes and/or users
- **CONDITIONS=YES**
  - **MUSTBE=EMPTY** – reject if contains notes
  - **MUSTBE=UNUSED** – reject if has users (note pad connectors)
  - **MUSTBE=(EMPTY,UNUSED)** – reject if either notes or users
- **TIMEOUT** – seconds to allow for completion

---

## When Note Pad is Deleted, XCF:

- Rejects request if MUSTBE conditions not met
- Fences the note pad so that:
  - Coupling facility rejects in-flight note requests
  - Systems reject create connection requests
- Deletes all remaining connections
- Deletes all remaining notes

---

## Note Pad Failures

- Note Pad fails if:
  - Note Pad structure fails
  - CF containing note pad fails
  - XCF loses its catalog of note pads
  - Sysplex is reIPLed
- Note Pad failure implies
  - Loss of all notes
  - All connections deleted

---

## For More Information

- Documentation available on the web at:

[publibz.boulder.ibm.com/zoslib/pdf/OA38450.pdf](http://publibz.boulder.ibm.com/zoslib/pdf/OA38450.pdf)

 #SHAREorg



# Questions?

## z/OS XCF Note Pad Usage and Exploitation

### Session 13083

Please fill out the online session evaluation at  
[SHARE.org/SanFranciscoEval](http://SHARE.org/SanFranciscoEval)

or

Aim your smartphone at this QR code:

