# How to Take Advantage of VM/ESA`s System Configuration Capabilities

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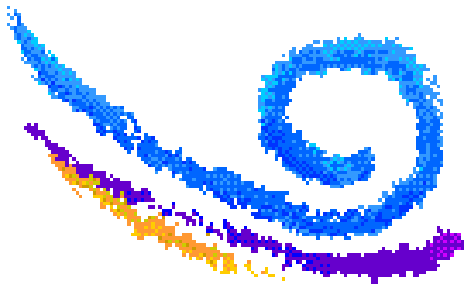
# Trademarks





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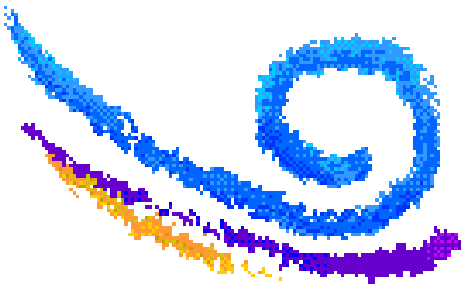
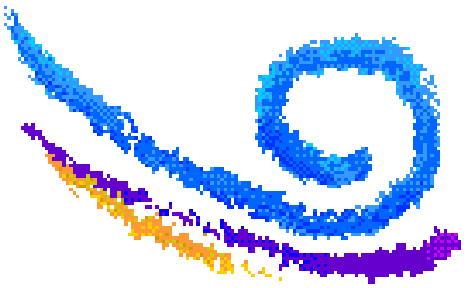
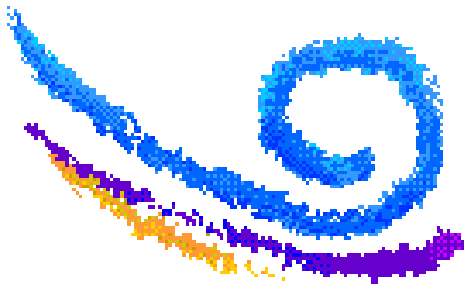


# Topics

- Benefits of Dynamic Configuration
- Elements of Dynamic CP Configurability
- Dynamically Changing Your CP Configuration
- Elements of Dynamic I/O Configuration
- Dynamically Changing your I/O Configuration

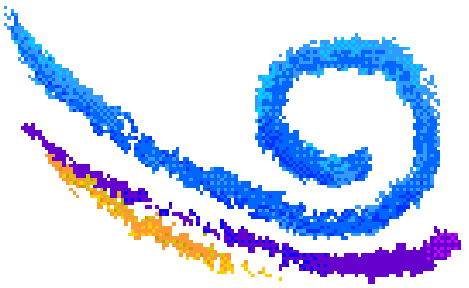


# Benefits of Dynamic Configuration



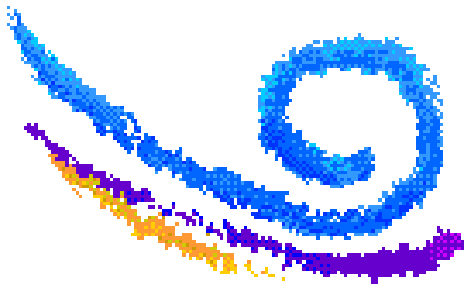
# CP Configurability

- Change system-wide definitions and defaults without IPL
  - timezone
  - system operator
  - log messages
  - security features
  - paging and spooling areas
  - command class restructure
  - CP Exits and extensions to CP such as user Diagnose codes
- Change definitions without rebuilding the system
  - Checkpoint and Warmstart locations and size
  - Storage sizes: RIO370, V=R, V=R Free, Trace
- New devices may be added dynamically
  - no need to update configuration files

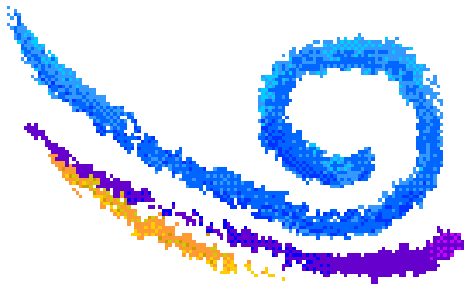


# Dynamic I/O Configuration

- Modify the hardware I/O definitions (IOCDS) without an outage
  - Add, change, delete CHPID, CNTLUNIT, IODEVICE
  - Manage I/O definitions for all LPARs on a processor
  - Commands based on hardware requirements
- Modify the software view of I/O definitions
  - Reset I/O control blocks
    - Devices that do not support Sense commands
    - Clear control blocks of devices with errors

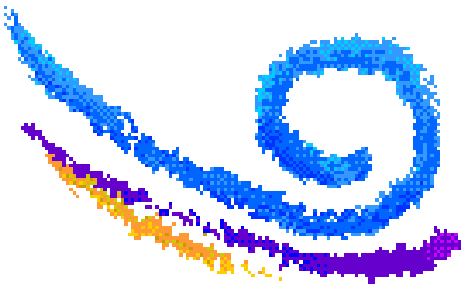


# Elements of CP Configurability



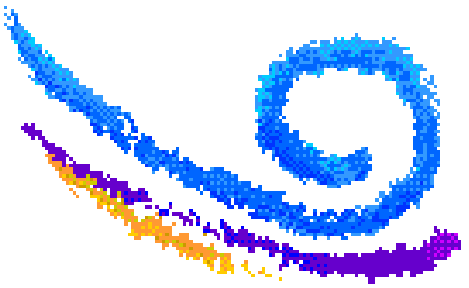
# Elements of CP Configurability

- PARM Disk
- Stand Alone Program Loader (SAPL)
- System Configuration Files
- Logo Files
- Commands to dynamically change the CP configuration



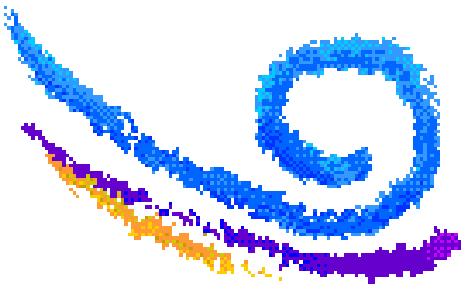
# The PARM Disk

- A CMS-formatted disk that CP uses during initialization
- Usually on the IPL volume
  - Default location is cylinder offset zero of IPL volume
  - Multiple PARM extents may be defined on the IPL and other volumes
  - May be located by
    - Real address
    - Cylinder offset
    - Number of PARM extent
- Contains
  - CP module to be IPLed (possibly)
  - System and logo configuration files



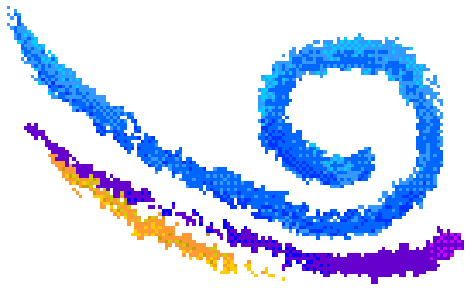
# Stand Alone Program Loader (SAPL)

- Specify IPL information
  - Parm disk address
  - Parm disk offset
  - CP MODULE name
  - Load origin
- Specify IPL parms
  - Console address
  - CP config filename and filetype
  - Whether to PROMPT for date/time and warm/cold start
  - Storage size



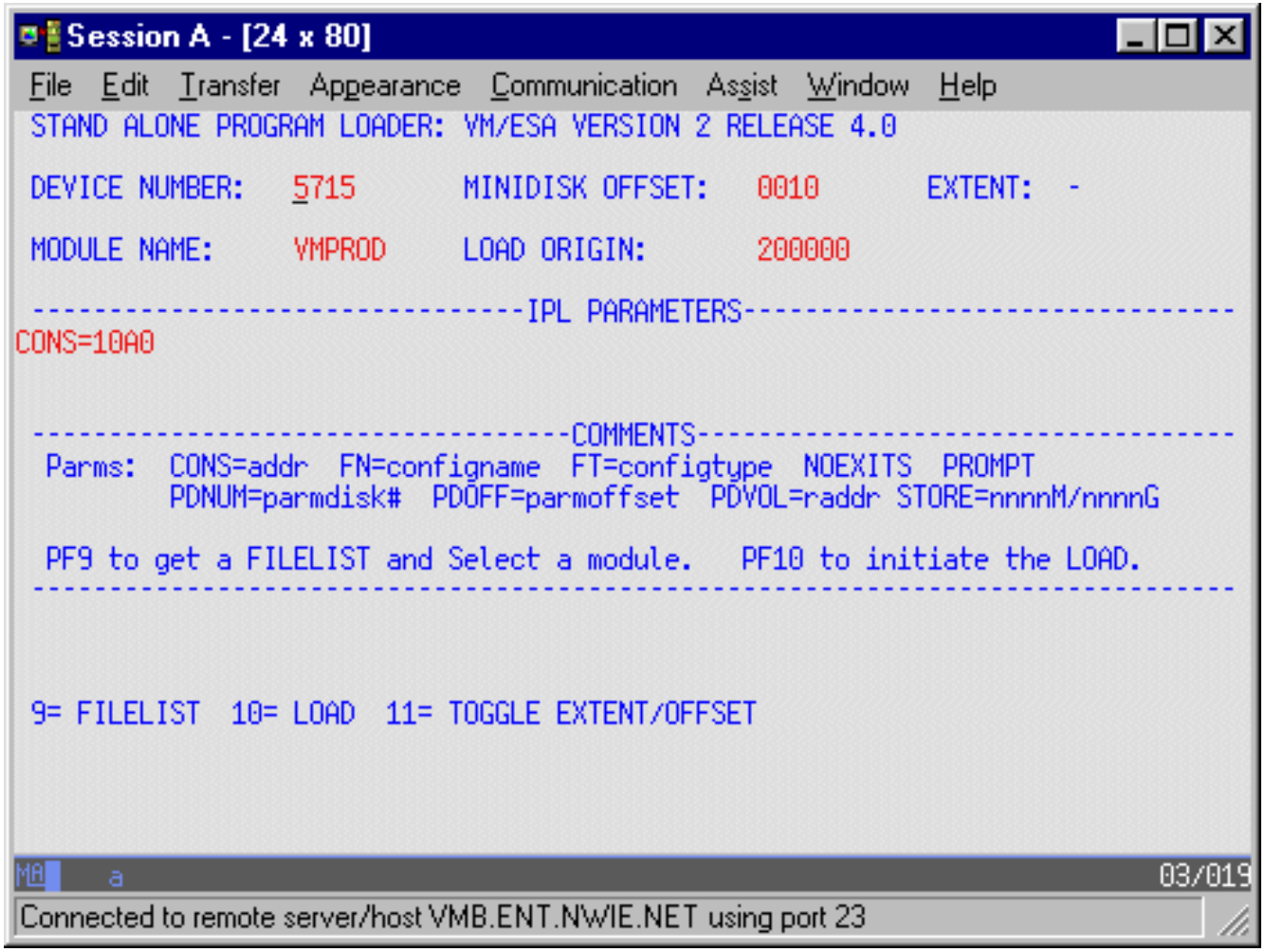
# Stand Alone Program Loader (SAPL)

- Can display panel to modify IPL information
  - Add LOADPARM of console on hardware console or virtual machine IPL command to cause panel to display
- Panel allows override of all defaults set in SAPL
- Panel allows FILELIST of PARM disk to be displayed
- Can be used to load programs other than your default nucleus
  - DDR Stand-alone DDR
  - DIRECTXA Stand-alone DIRECTXA
  - ICKSADSF Stand-alone ICKDSF



# Stand Alone Program Loader (SAPL)

- Sample SAPL panel display



# Stand Alone Program Loader (SAPL)

- Sample of SAPL filelist

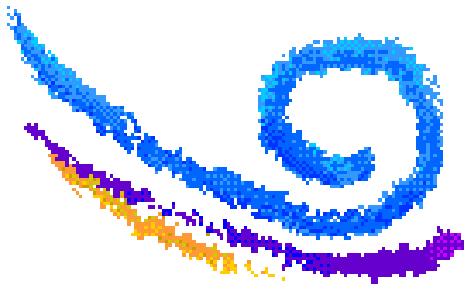
Session A - [24 x 80]

File Edit Transfer Appearance Communication Assist Window Help

```
STAND ALONE PROGRAM LOADER: VM/ESA VERSION 2 RELEASE 4.0
FILENAME FILETYPE FORMAT LRECL    RECORDS     BLOCKS    DATE       TIME
ICKSADSF MODULE   V      65535        15        219 2000/02/14 10:42:37
VMPROD   MODULE   V      65535        77       1205 2000/02/03  8:20:53
PRINTSEP VMB      V         32        10          1 2000/01/04 13:05:19
LDEV     VMB      V         73        16          1 2000/01/04 13:05:19
TCPIP2   VMB      V         73        16          1 2000/01/04 13:05:17
SYSTEM   CONFIG   F         80       617         13 1999/12/14  7:06:17
NW       CLASS    V         67        29          1 1998/09/28 21:31:34
TTRSTC   TXTTTR   F         80        46          1 1998/09/02 14:01:41
TTRDIA   TXTTTR   F         80        29          1 1998/09/02 14:01:35
VMTIMFAC DIAG01E0 F         80        11          1 1997/10/22 15:00:13
LOGOVMB  CONFIG   V         69       107          2 1997/07/18  9:46:04
RICKS    VMB      V         77        24          1 1997/07/18  6:56:07
DDR      MODULE   V      65535         4         31 1997/06/27 13:56:46
DIRECTXA MODULE   V      65535         4         20 1996/09/30  6:24:02
NW       COMMANDS F         80        33          1 1995/08/02  9:49:27
CPCACHE  FILES    F         80         5          1 1994/11/17 13:27:55
INPTAREA DEFAULT  F         78         6          1 1993/10/14 12:23:53
3=QUIT  4=SORT(TYPE)  5=SORT(DATE)  6=SORT(NAME)  7=BACK  8=FORWARD  11=SELECT
```

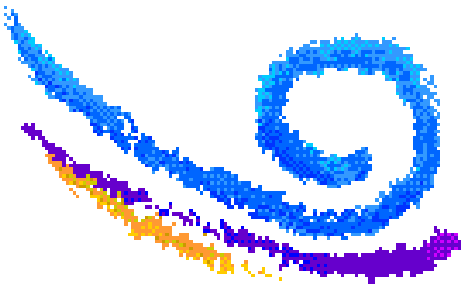
MA a 01/001

Connected to remote server/host VMB.ENT.NWIE.NET using port 23



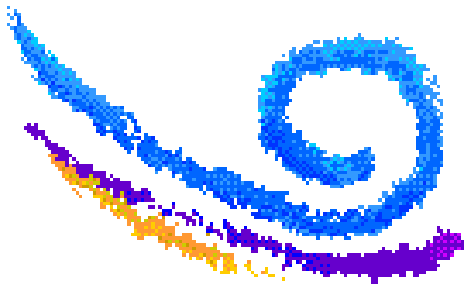
# The System Configuration File

- CMS file which resides on the PARM disk
  - Default name is SYSTEM CONFIG
    - must be used if IPLing a nucleus
- Skeleton HCPSYS and HCPRIO files still required
  - SYSEND in HCPSYS
  - RIOGEN CONS=DYNAMIC in HCPRIO
- HCPSYSCP and HCPRIOCP used for CP module
- Statements in configuration file override synonymous statements in HCPSYS and HCPRIO files



# The System Configuration File...

- System definition parameters
  - Everything previously defined in HCPSYS
- I/O device definitions
  - Previously defined in HCPRIO
  - Only necessary for devices which do not respond to sense ID
  - Alter default characteristics for specific devices
  - How to handle specific devices at initialization
- Additional system-wide options
  - which devices to bring online at IPL time
  - which timezone to select
  - whether to autolog special user IDs
  - whether to attempt an automatic warmstart
  - number of command retrieve buffers
  - default terminal characters
  - ...

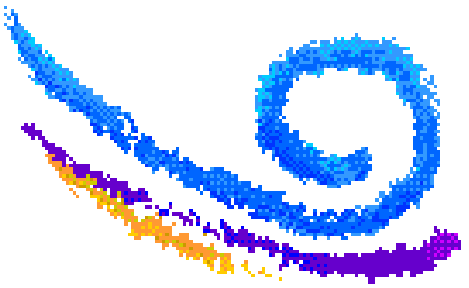


# Conditional Statements/Imbeds

- Conditional Statements are based on System_Identifier labels

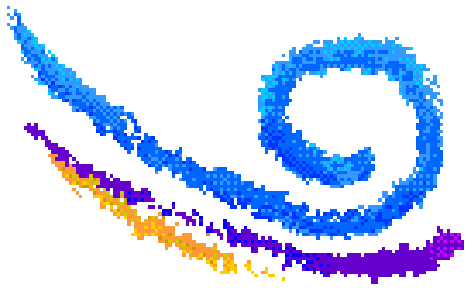
```
System_Identifier 9672 012345 MYVM1
System_Identifier 9672 0A2345 MYVM2
MYVM1: Operator_Consoles    0C00 0C01
MYVM2: Operator_Consoles    1C00 1C01
MYVM1: MYVM2: Features ,
 Enable ,
     Auto_Warm_IPL
```

- Imbeds allow statements to be included from other files
  - Useful for sections common to multiple systems
    - Command class overrides
    - User diagnose



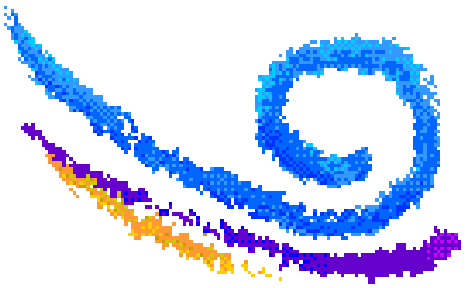
# DEVICES Statement

- Tell CP how to handle specified devices at initialization
  - Whether to:
    - Accept
    - Allow dynamic changes
    - Initialize at IPL
    - Measure subchannels
    - Assign tape drive to system
    - Use sense ID information to define device
    - Share dasd between operating systems
    - Throttle I/O rate
  - If no DEVICES statement is coded for a device, defaults depend on
    - How system was IPLed
      - module
      - nucleus
    - How SYSOPTS macroinstruction was coded in HCPSYS
      - SENSE=YES (default)
      - SENSE=NO



# Rdevice

- Tell CP what kind of devices are at specific addresses
  Use when devices can't be sensed
  - Unit Record
    - Printers, Card punches/readers
  - Communication controllers and line adapters
  - DASD
  - Graphic display devices
  - Special devices
  - Tape units
  - Unsupported devices



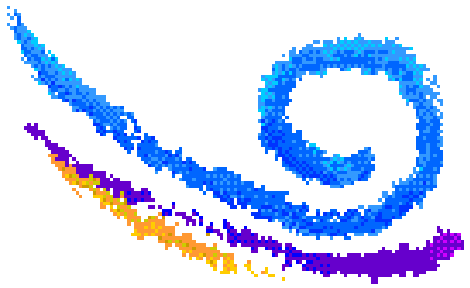
# Consoles

- Operator_Consoles tell CP where to try to display IPL messages
  - If no devices in this list are functional, IPL Wait State 1010
  - Probably located in data center or computer operations area

- Emergency_Message_Consoles tell CP where to display critical messages such as ABEND and RESTART
  - Include most IPL consoles
  - Also include System Programmer consoles

- Sample:

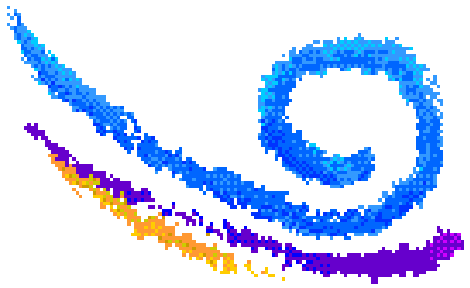
```
MYVM1:   Operator_Consoles              0C00 0E00
MYVM1:   Emergency_Message_Consoles     0C00 0E00 1234

MYVM2:   Operator_Consoles              0D00 0F00
MYVM2:   Emergency_Message_Consoles     0D00 0F00 1235
```



# CP_Owned

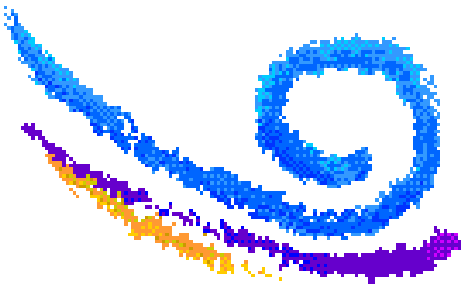
- Define DASD volumes that will contain System Areas
  - Page
  - Spool
  - TDISK
  - DRCT
- Spare slots can/should be defined for adding volumes
- Volumes may also be marked DRAIN to prevent further allocation
- Sample:

```
MYVM1:   CP_Owned   Slot    1   VMRES1
MYVM1:   CP_Owned   Slot    2   VMSPL1
MYVM1:   CP_Owned   Slot    3   VMPAG1
MYVM1:   CP_Owned   Slot    4   RESERVED

MYVM2:   CP_Owned   Slot    1   VMRES2
MYVM2:   CP_Owned   Slot    2   VMSPL2
MYVM2:   CP_Owned   Slot    3   VMPAG2
```



# DRAIN/START (Disk) Statements

- Stop and start new CP operations on specified DASD
  - Existing data and allocations remain after draining
  - Specify by
    - rdev
    - rdev range
    - volid
  - Stop and start CP from doing the following on specified devices:
    - writing pages
    - allowing links to minidisks
    - allocating spool space
    - allocating TDisk space



# DRAIN/START (Disk) Statements...Examples

*Example #1 - Have CP:*

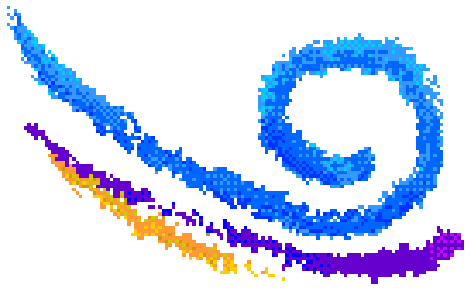
- Stop all operations on all DASD between X'0700' and X'07FF',
- Allow users to link to minidisks on DASD X'0700', and
- Ensure that CP can write pages to the CP-owned paging pack (SYSPG1), if someone moves that DASD to one of the addresses that are draining (X'0700' through X'07FF')

```
Drain  DASD   0700-07ff  All
Start  DASD   0700       Links
Start  Volid  SYSPG1     Page
```

*Example #2 - Have CP start allowing:*

- All new operations on all DASD at real devices numbers X'0700' through X'07FF'
- Spooling on DASD at real device number X'0800'
- Paging on volume SYSPG1 (previously defined on a CP_OWNED statement)

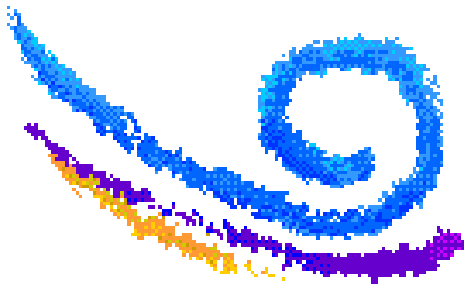
```
Start  DASD   0700-07ff  All
Start  DASD   0800       Spool
Start  VolID  syspg1     Page
```



# Timezone Definition/Boundary

- TimeZone_Definition statements tell CP how to set the local time relative to the hardware clock
- TimeZone_Boundary statements tell CP which previously defined TimeZone should be active at IPL time.
  - There must be at least one Boundary with a date/time older than IPL time or CP will default to the hardware clock date/time
- Sample statements

```
TimeZone_Definition EST West 05.00.00
TimeZone_Definition EDT West 04.00.00
TimeZone_Boundary on 1999-10-31 at 02:00:00 to EST
TimeZone_Boundary on 2000-04-02 at 02:00:00 to EDT
```



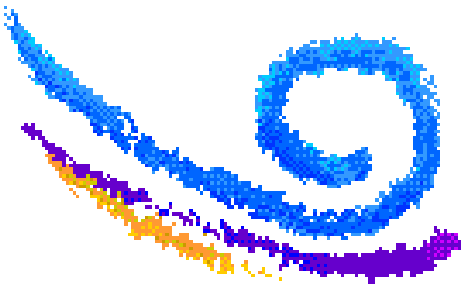
# FEATURES Statement

## IPL Attributes

- AUTO_WARM_IPL
- PROMPT...
  - AFTER_RESTart
  - AFTER_SHUTDOWN_REIPL
  - AFTER_POWERoff

## Authorize users system-wide to use certain functions

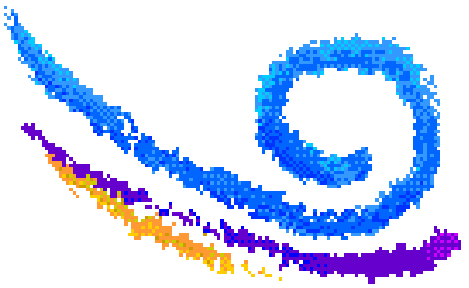
- SET_DYNamic_i/o, SET_DYNamic_io
- SET_DEVices
- SET_PRIVclass



# FEATURES Statement...

Tell CP whether, and how, to activate certain system functions

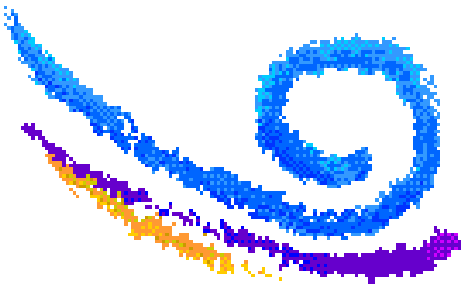
- CPCHECKING
  - ABEND
  - VMSTOP
- CLEAR_TDisk at initialization
- LOGMSG_FROM_File
  - SHOW_ACCount Yes/No
  - SHOW_ACIgroup Yes/No
  - SHOW_Userid Yes/No
- NEW_DEVices_initialized_when_added
- THROTTLE_ALL



# FEATURES Statement...

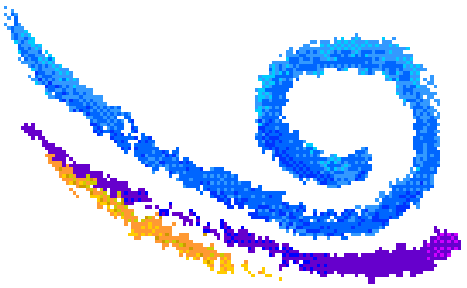
## Misc. system and user functions

- Number of MAXusers (or NOLimit)
- PASSWORDS_ON_CMDS
  - AUTOLog Yes/No
  - LINK Yes/No
  - LOGon Yes/No
- Number of RETRieve buffers per user
  - DEFault
  - MAXimum
- VDISK/VDSK installation default limits
  - Syslim
  - Userlim
  - Infinite



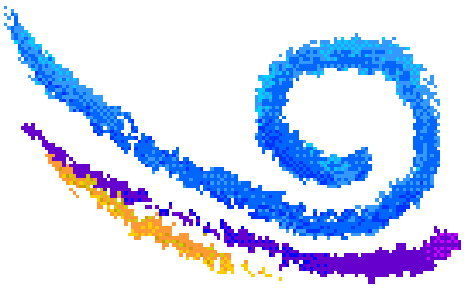
# Features Statement...Coming Soon

- New AUTO_IPL features
  - AUTO_IPL
  - AUTO_IPL_AFTER_RESTart
  - AUTO_IPL_AFTER_SHUTDOWN_REIPL
- All types of IPL available for each AUTO_IPL feature
  - CLEAN
  - COLD
  - FORCE
  - WARM
- IPL Options may also be specified
  - NOENABLE
  - DRAIN
  - NOAUTOLOG
  - NODIRECT



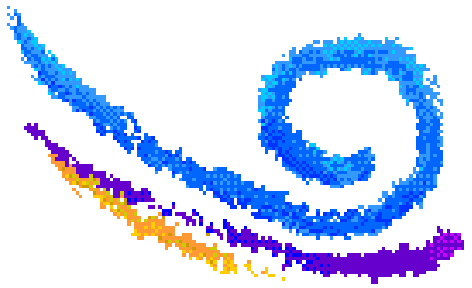
# Features Statement...Coming Soon

- IPL_MESSAGES
  - tell CP whether or not to display IPL messages or prompts
- DISCONNECT_TIMEOUT
  - nnnnnn
    - Sets interval between a forced disconnect and its logoff to specified number of minutes
  - OFF
    - Disables automatic logoff



# Logo Files

- LOGO CONFIG (default name unless specified on LOGO_CONFIG statement of SYSTEM CONFIG)
  - Specify information about logos for terminals and printers
  - Specify text for status area of terminals
- Logos may be selected based on criteria
  - Screen size
  - Device address
  - The ID of the virtual machine creating a logical device.
  - The ID of the VTAM service machine (VSM) managing a terminal session
- You can alter:
  - The format of the input area for user IDs, passwords, and commands
  - The contents of the online message at the top of the screen
  - The contents of the status areas, such as CP READ, VM READ, and so forth.

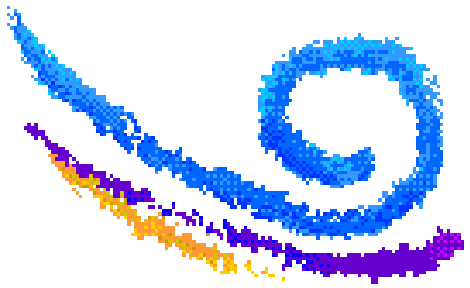


# Logo Files

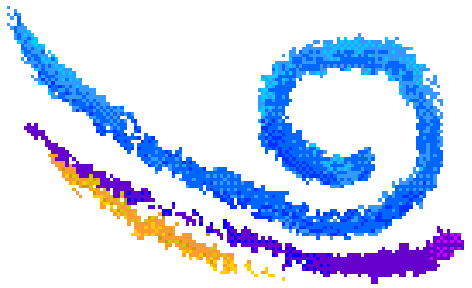
- All Logo files can be updated dynamically
- DRAWLOGO tool supplied to help in drawing LOGO files
- Updated files must be written to a PARM disk.
  CPACCESS the disk to cause CP to re-read the files.
- Changes activated with CP commands
  - CP REFRESH LOGOINFO filename CONFIG
  - CP REFRESH LOGOVSM user-id
- I/O to PARM disk reduced using CPCACHE FILES on PARM disk
  - Sample:

```
*          CONFIG
*          LOGMS*
*          VMB
*          LOGO
INPTAREA DEFAULT
```

  - CP looks for CPCACHE FILES when a parm disk is CPACCESSed and reads the files into storage

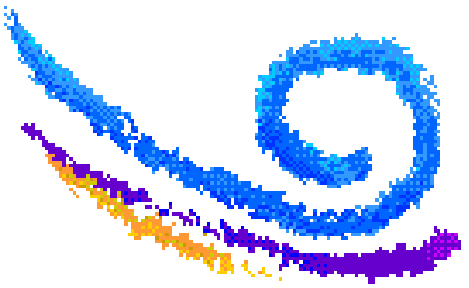


# Dynamically Changing your CP Configuration



# Commands to Dynamically Change CP Configuration


- DEFINE/QUERY
  - CPOWNED
  - (spooling device)
  - TIMEZONE
- SET/QUERY
  - PROMPT
  - RDEVICE
  - TIMEZONE
  - RETRIEVE
- START/DRAIN DASD



# Commands to Match SYSTEM CONFIG Statements

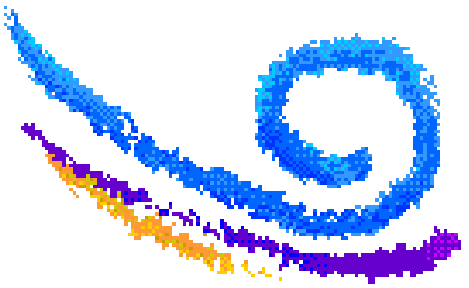


- CP SET subsommands that correspond to SYSTEM CONFIG

```
Session A - [32 x 80]
File  Edit  Transfer  Appearance  Communication  Assist  Window  Help
CPSET MENU                  Menu Help Information                line   17:50
(C) Copyright IBM Corporation 1990, 1999

The file names listed below represent CP SET commands.

A file may be selected for viewing by placing the cursor under any
character of the file wanted and pressing the ENTER key or the PF1 key.
A MENU file is indicated when a name is preceded by an asterisk (*).
For a description of the HELP operands and options, type HELP HELP.


*CMSSET   CMDLIMit  DUMP      LKFACR    NEW_DEV   RECord    SVC76
*CP       CONCeal   DYNamic   LOGmsg    NOPDATA   REServed  SYSOPER
*CPOTHER  CONFIGmod D8ONECMD  MACHine   NOTRans   RETrieve  THROTtle
*CPQUERY  CPCHECKin EMSG      MAXLdev   NVS       RUN       TIMER
*CPUTIL   CPCONIo   HOTIO     MAXUsers  PAGEX     SCMeasure TIMEZONE
*RDEVICE  CPLANGua  IMSG      MDCache   PASSWORD  SECUSER   TRACEFRA
*SET      CPTRace   IOAssist  MIH       PFnn      SHARE     VDISK
ABEND     CPUid     IOCDS_act MITIMe    PRIVclas  SHARED    VMCONIo
ACCount   CRYPTO    IPLparms  MODE      PRODUCT   SMsg      VTOD
AUTOPoll  DASDFW    JOurnal   MONData   PROMPt    SRM       WNG
CACHE     DATEForma LINEDit   MSG       QUICKDsp  STGEXemp  WRKALleg
CACHEFW   DEVICes   LKFAC     MSGFac    RDEVice   STGLimit  370Accom
CCWtran
* * * End of File * * *


PF1= Help      2= Top       3= Quit      4= Return      5= Clocate   6= ?
PF7= Backward  8= Forward   9= PFkeys   10=           11=          12= Cursor

====> _
                                                    Macro-read 1 File
MA    a                                                        31/007
Connected to remote server/host 172.24.251.75 using port 23
```

# Changing Real Device Definitions

- SET RDEVICE command can be used to add, change, or clear the system's definition of real devices
  - Advanced function printers
  - Card punches
  - Card readers
  - Communication controllers
  - DASDs
  - Graphic display devices
  - Impact printers
  - Integrated communication adapters
  - Special devices
  - Tape units
  - Unsupported devices
    - must be dedicated to a virtual machine
  - 3270 displays
  - 3800 printers
- Devices must be varied offline before they can be changed
- Cannot be used to change devices that are defined in HCPRIO



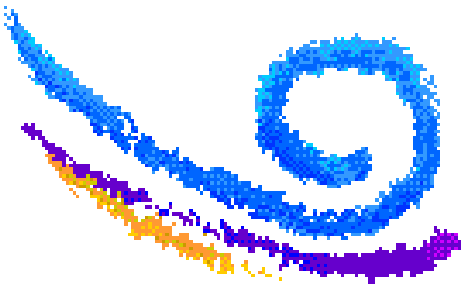
# Dynamically Adding a CP Owned Volume

- Define reserved slots in CP_Owned list in config file

```
CP_Owned  Slot  1  JF1RES
CP_Owned  Slot  2  SPOOL0
CP_Owned  Slot  3  MDSP0
CP_Owned  Slot  4  RESERVED
CP_Owned  Slot  5  RESERVED
```

- Query CP_Owned list for available slots

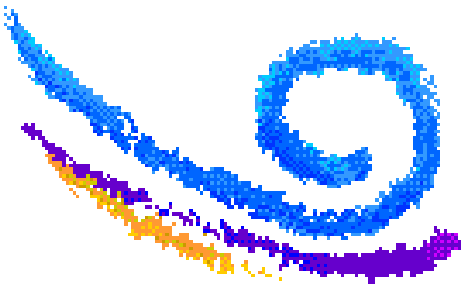
```
query cpowned
 Slot  Vol-ID   Rdev    Type    Status
    1  JF1RES    0A40  Own     Online and attached
    2  SPOOL0  0780    Own     Online and attached
    3  MDSP0   0880    Own     Online and attached
    4  ------    ----    -----   Reserved
    5  ------    ----    -----   Reserved
```



# Dynamically Adding a CP Owned Volume

- Format and Allocate the new volume
  - Using ICKDSF
    - CPVOL FMT MODE(ESA) UNIT(rdev) VOLID(volser) NOVFY

    - CPVOL ALLOC MODE(ESA) UNIT(rdev) VFY(volser) -
      TYPE((PERM,0,9) (PARM,10,75) (PARM,75,139) -
      (PERM,140,1059) (DRCT,1060,1084) -
      (SPOL,1085,1584) (PAGE,1585,2084) (TDSK,2085,2584) -
      (PERM,2585,3339))



# Dynamically Adding a CP Owned Volume...

- Replace a reserved entry in the config file with the new volume
  - For next IPL

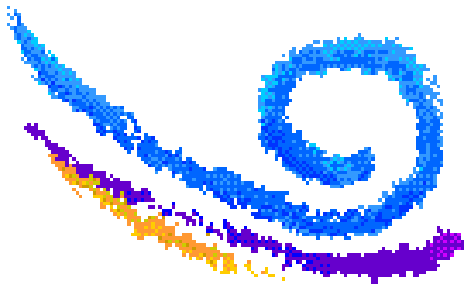
```
CP_Owned  Slot  1  JF1RES
CP_Owned  Slot  2  SPOOL0
CP_Owned  Slot  3  MDSP0
CP_Owned  Slot  4  CPNEW
CP_Owned  Slot  5  RESERVED
```

- Define new volume to running system

```
define cpowned slot 4 cpnew
```

- Attach new volume to system

```
att 980 system

query cpowned
Slot  Vol-ID    Rdev    Type    Status
  1   JF1RES     0A40   Own     Online and attached
  2   SPOOL0   0780   Own     Online and attached
  3   MDSP0    0880   Own     Online and attached
  4   CPNEW    0980   Own     Online and attached
  5   ------     ----    -----   Reserved
```



# Dynamically Deleting a CP Owned Volume...

- Stop all CP activity on the volume

  drain volid cpnew all

- Determine when volume is no longer being used

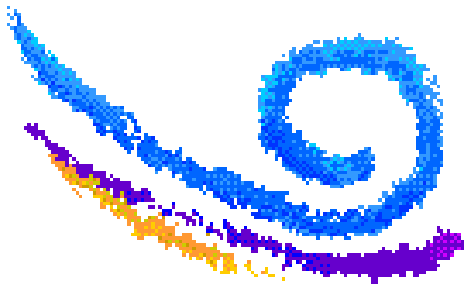
  q alloc CPNEW

  DASD 0980 CPNEW 3380 CKD-CKD (UNITS IN CYLINDERS)
  TDISK TOTA L=000000 INUSE=000000 AVAIL=000000, DR
  PAGE TOTAL =000000 INUSE=000000 AVAIL=000000, DR
  SPOOL TOTAL=000005 INUSE=000000 AVAIL=000005, DR
  DRCT TOTAL =000000 INUSE=000000 AVAIL=000000

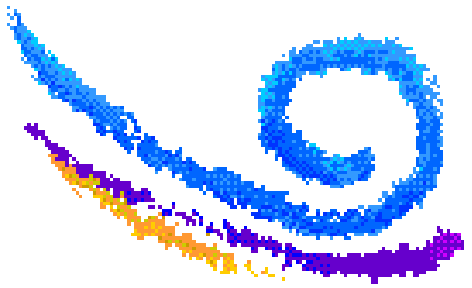
- Detach volume from system and vary offline

  det 980 system
  vary 980 offline

| Slot | Vol-ID | Rdev | Type | Status |
|---|---|---|---|---|
| 1 | JF1RES | 0A40 | Own | Online and attached |
| 2 | SPOOL0 | 0780 | Own | Online and attached |
| 3 | MDSP0 | 0880 | Own | Online and attached |
| 4 | CPNEW | ---- | Own | Offline |
| 5 | ------ | ---- | ----- | Reserved |

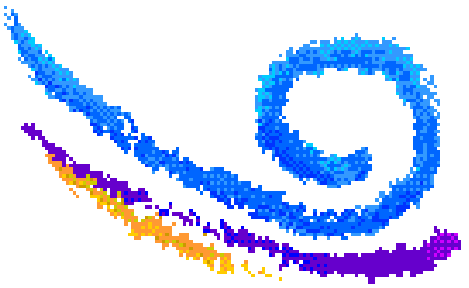


# Dynamic I/O Reconfiguration



# Elements of Dynamic I/O Reconfiguration

- Facilities for Enabling dynamic I/O configuration
  - Hardware
  - Software
- IOCP/IOCDS file
- Hardware and Software Functions and Commands
  - Add/Modify/Delete Definitions
    - Channel Paths
    - Control Units
    - I/O Devices
  - Select or Change active IOCDS

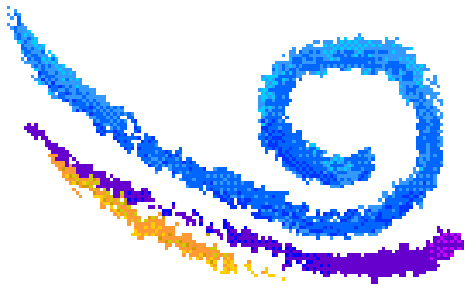


# Enabling Dynamic I/O on Hardware

- IBM
  - 9021
    - CONFIG frame; section H= I/O DEFINITION
    - Selection H1 to specify Total and Shared "Percent Expansion"
  - 9672
    - Customize Activation Profiles; Dynamic 'tab'
    - Type value in "Percent Expansion" and percent shared if required

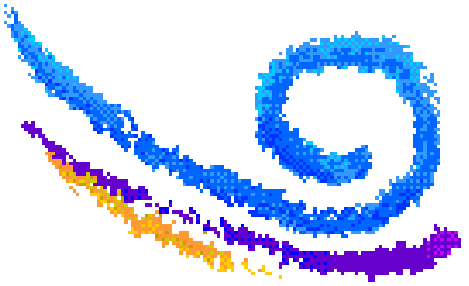
- Hitachi
  - Skyline
    - SYSCNF; select OPTION S to enable Dynamic Reconfiguration Management
      PROCNF; OPTION R0 to allow HSA Expansion
      OPTION R1 to specify percent of HSA reserved for expansion
      OPTION R2 to specify shared percent

- Amdahl
  - I have never worked with Dynamic I/O on Amdahl



# Authorizing Dynamic I/O on Hardware

- IBM
  - 9021
    - LPSEC Frame; Specify An B2 to give selected LPAR control authority for the I/O Configuration
  - 9672
    - Change Logical Partition Security panel; specify 1 under Input/Output Configuration Control
- Hitachi
  - Skyline
    - LPRCTL; select Y under IO column for desired partition(s)
- Amdahl
  - I have never worked with Dynamic I/O on Amdahl

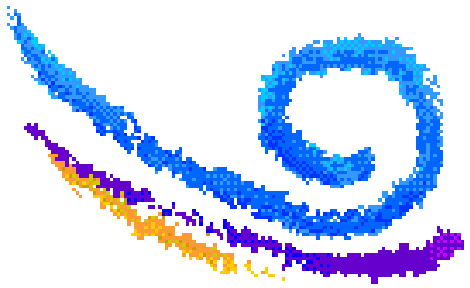


# Enabling dynamic I/O in software

- SYSTEM CONFIG
  - Features, Enable,

    DYNamic_I/O, Allow hardware I/O changes
    SET_DYNamic_io, Allow use of SET DYNamic ON/OFF command
    SET_DEVices, Allow privileged users to reset CP's view of real devices
    NEW_DEVices_initialized_when_added
    CP will create a real device control block (RDEV) when it receives an I/O machine check (IOMCK)

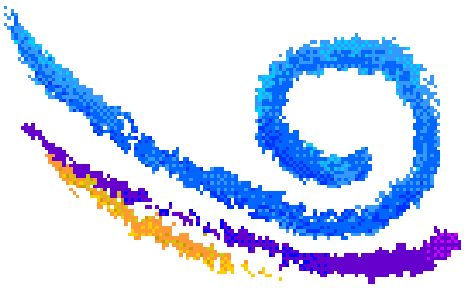
  - May need spare subchannel measurement blocks (SCMBK) defined in the STORage section of SYSTEM CONFIG
    - SCMBKs are needed to record subchannel statistics
    - Query SCMBK will show what is currently free
    - If you add more devices than you have SCMBKs available, a message is displayed for each device



# IOCP/IOCDS preparation

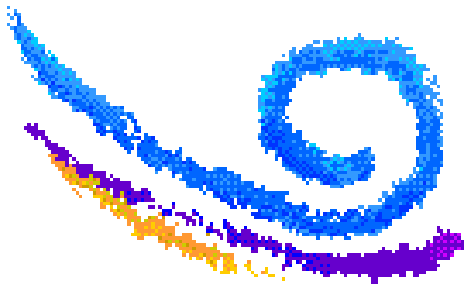
- Choose which LPAR will "own" the configuration; make all changes from that LPAR
- IOCP EXEC and programs from CMS 12 or higher needed
- Write the IOCDS from that LPAR

  IOCP iocpname ( DYN IZP WRTxx LPAR
  - DYN indicates that the IOCDS will be written with a TOKEN that will be used after POR to prevent other LPARs from modifying the I/O configuration
  - IZP is used to cause IOCP to write an IOCDS for an EMIF-capable processor
  - LPAR indicates that the IOCP contains multiple LPARs
- Shutdown VM and all other systems on the processor
- POR (IML) the processor
  - Must be done once to activate an IOCDS with a VM TOKEN



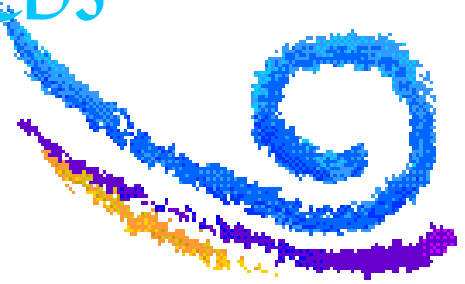
# Safe Dynamic I/O

- Dynamic I/O changes must be implemented in a careful process or you will not be able to activate a new IOCDS and all dynamic changes will be lost at a future machine POR.
- The designers call this a LOCKSTEP process.
- I recommend using an EXEC for all commands so that return codes can be checked and no further commands are executed.



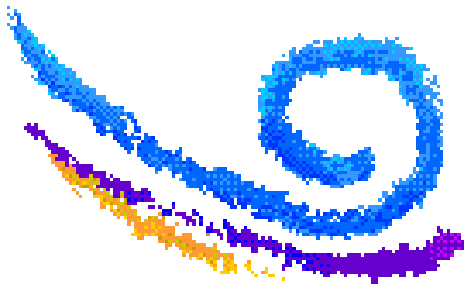
# Safe Dynamic I/O

- Update the IOCP source statements with proposed changes
- Run IOCP program with NOWRT option to check syntax
  - Do not load or activate
- Issue CP commands to dynamically make changes
  - NOTE: If any command fails, keep track of what was completed. Either reverse the completed commands or fix the failed commands. Write either the old or a new IOCP to a new IOCDS and activate it.
- If commands complete successfully, run IOCP again to write IOCDS
- Issue CP SET IOCDS_active to activate the new IOCDS
  - This will change the hardware pointer so that the new IOCDS is selected at a future POR.



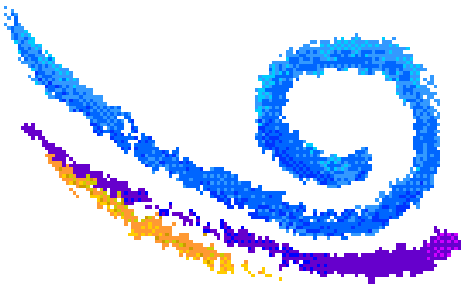
VM/ESA and VSE/ESA
TECHNICAL CONFERENCE

# Dynamically Changing your I/O Configuration



# Dynamically Changing your I/O Configuration

- Adding an OSA
- Adding a string of DASD
- Adding Channel Paths and bringing them online
- Removing Devices



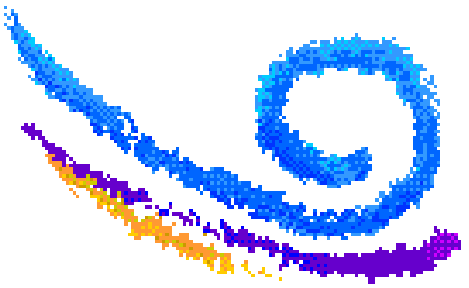
# Preparing to Make Dynamic Changes

- Verify that Dynamic I/O changes are allowed

```
Query DYN
Dynamic I/O changes are allowed on this system
```

- Verify that there are enough channel subsystem resources

```
Query DYN STOR
Remaining Channel Subsystem Resources for Dynamic I/O Changes:
Number of Subchannels for Unshared Paths: 596
Number of Control Units:                   93
Number of Unshared Channel Paths:        1611
Number of Shared Channel Paths:            73
```



# Preparing to Make Dynamic Changes

- Verify that CHPIDs are not in use

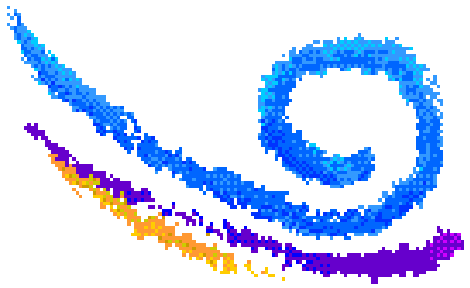
```
Query CHPIDS
        0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
    0x  .  .  .  .  +  .  +  +  .  .  +  .  +  +  +  +
    ...
    3x  +  .  +  +  +  +  +  +  +  +  +  +  .  .  .  .
    ...
    8x  +  -  +  +  -  .  .  .  +  .  +  +  +  +  +  +
    ...
    Bx  +  .  +  +  +  +  +  +  +  +  +  +  +  .  +  .
    ...
    Dx  .  -  .  .  .  .  -  .  .  .  .  .  +  +  +  +
    ...
    + Available
    - Offline
    . Not configured
```

# Adding Two OSAs

- A sample to add two OSAs:
  - IOCP

```
CHPID PATH=(00),SHARED,                                          *
      PARTITION=((SYC,VMB,VMC),(SYC,VMB,VMC)),TYPE=OSA
CHPID PATH=(D8),SHARED,                                          *
      PARTITION=((VMB,VMC),(SYC,VMB,VMC)),TYPE=OSA
CNTLUNIT CUNUMBR=8000,PATH=(00),UNIT=OSA
CNTLUNIT CUNUMBR=8001,PATH=(D8),UNIT=OSA
IODEVICE ADDRESS=(8000,002),CUNUMBR=(8000),STADET=Y,UNIT=OSA
IODEVICE ADDRESS=(8002,002),CUNUMMBR=(8000),STADET=Y,            *
      PARTITION=(VMB),UNIT=OSA
IODEVICE ADDRESS=801F,UNITADD=FE,CUNUMBR=(8001),STADET=Y,        *
      UNIT=OSAD
IODEVICE ADDRESS=(8010,002),UNITADD=00,CUNUMBR=(8001),           *
      STADET=Y,UNIT=OSA
IODEVICE ADDRESS=801F,UNITADD=FE,CUNUMBR=(8001),STADET=Y,        *
      UNIT=OSAD
```

  - Command to verify syntax
    - IOCP NEWIOCP1 (NOWRT DYN IZP LPAR



# Adding Two OSAs

- Commands (in an EXEC)

```
/* Dynamically add an OSA */
Address 'COMMAND'
'CP SPOOL CONSOLE TO * START NAME DYNAMIC IOCP'
Signal On Error
Trace 'C'
'CP DEFINE CHPID 00 TYPE OSA SHARED ACC SYC VMB VMC INIT SYC VMB VMC'
'CP DEFINE CHPID D8 TYPE OSA SHARED ACC SYC VMB VMC INIT VMB VMC'

  'CP DEFINE CU 8000 TYPE OSA CHPID 00'
'CP DEFINE CU 8001 TYPE OSA CHPID D8'

  'CP DEFINE DEV 8000-8001 UNITADD 00 CU 8000 PART SYC VMB VMC'
'CP DEFINE DEV 8002-8003 UNITADD 02 CU 8000 PART VMB'
'CP DEFINE DEF 800F      UNITADD FE CU 8000'
'CP DEFINE DEV 8010-8011 UNITADD 00 CU 8001 PART SYC VMB VMC'
'CP DEFINE DEF 801F      UNITADD FE CU 8001'

Signal Off Error
'EXEC IOCP NEWIOCP1 (WRTA3 LPAR DYN IZP'
Say IOCP RC='rc
If rc \> 4 Then Do
        'ERASE NEWIOCP1 LISTING'
        'CP SET IOCDS A3'
    End
Error:
erc = rc
'CP SPOOL CONSOLE STOP CLOSE'
Exit erc
```

# Did it Work?

- Verify CHPIDs status

```
Query CHPIDS
     0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
0x   -  .  .  .  +  .  +  +  .  .  +  .  +  +  +  +
...
3x   +  .  +  +  +  +  +  +  +  +  +  +  .  .  .  .
...
8x   +  -  +  +  -  .  .  .  +  .  +  +  +  +  +  +
...
Bx   +  .  +  +  +  +  +  +  +  +  +  +  +  .  +  .
...
Dx   .  -  .  .  .  .  -  .  -  .  .  .  +  +  +  +
...
+ Available
- Offline
. Not configured
```

- Query the paths to the device

```
Query PATHS 8000
    Device 8000 does not exist
```

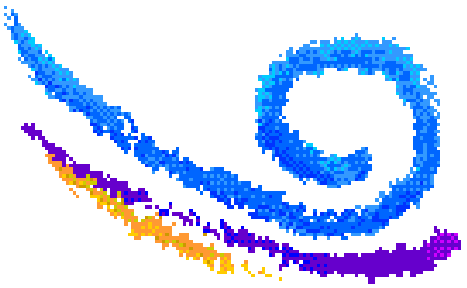
# The Last Step

- Vary the channel path online

```
vary on chpid 00
Channel path 0000 was successfully varied online
Device 8000 is available and online.
Device 8001 is available and online.
Device 8002 is available and online.
Device 8003 is available and online.
Device 800F is available and online.
```

- Query the devices

```
q 8000-8003 800f
OSA  8000 FREE , OSA  8001 FREE , OSA  8002 FREE , OSA  8003 FREE
OSA  800F FREE
```



# Check it Out

## ► Verify CHPIDs status

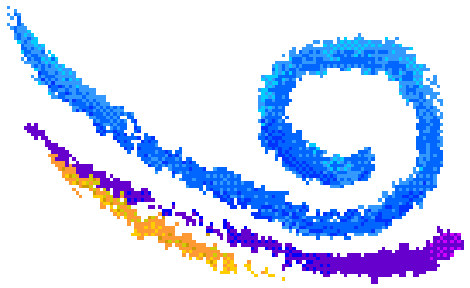
Query CHPIDS

```
        0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
    0x  +  .  .  .  +  .  +  +  .  .  +  .  +  +  +  +
    ...

    + Available
    - Offline
    . Not configured
```

## ► Query the paths to the device

Query PATHS 8000

```
    Device 8000, Status ONLINE
     CHPIDs to Device 8000 (PIM)   : 00
      Physically Available (PAM)   : +
      Online               (LPM)   : +
                           Legend      + Yes - No
```



# Adding a string of DASD

- A sample to add a string of DASD:
  - IOCP

```
CHPID PATH=(05),SHARED,                                          *
      PARTITION=((SYC,VMB,VMC),(SYC,VMB,VMC)),SWITCH=01,         *
      TYPE=CNC
CHPID PATH=(31),SHARED,                                          *
      PARTITION=((SYC,VMB,VMC),(SYC,VMB,VMC)),SWITCH=01,         *
      TYPE=CNC
CHPID PATH=(89),SHARED,                                          *
      PARTITION=((SYC,VMB,VMC),(SYC,VMB,VMC)),SWITCH=02,         *
      TYPE=CNC
CNTLUNIT CUNUMBR=1340,PATH=(05,89),UNITADD=((00,128)),           *
      LINK=(A1,A1),UNIT=3990
CNTLUNIT CUNUMBR=1440,PATH=(31),UNITADD=((00,128)),              *
      LINK=(E1),UNIT=3990
IODEVICE ADDRESS=(4000,128),CUNUMBR=(1340,1440),STADET=Y,        *
      UNIT=3390
```

  - Command to verify syntax
    - IOCP NEWIOCP2 (NOWRT DYN IZP LPAR

# Adding a String of DASD

- Commands (in an EXEC)

```
/* Dynamically add a string of DASD */
Address 'COMMAND'
'CP SPOOL CONSOLE TO * START NAME DYNAMIC IOCP'
Signal On Error
Trace 'C'
'CP DEFINE CHPID 05 TYPE CNC SWITCH 01',
                    'SHARED ACC SYC VMB VMC INIT SYC VMB VMC'
'CP DEFINE CHPID 31 TYPE CNC SWITCH 01',
                   'SHARED ACC SYC VMB VMC INIT SYC VMB VMC'
'CP DEFINE CHPID 89 TYPE CNC SWITCH 02',
                     'SHARED ACC SYC VMB VMC INIT SYC VMB VMC'

'CP DEFINE CU 1340 TYPE ESCON UNITADD 00-7F LINK A1 PATH 05 89'
'CP DEFINE CU 1440 TYPE ESCON UNITADD 00-7F LINK E1 PATH 31'

'CP DEFINE DEV 4000-407F UNITADD 00 CU 1340 1440 DASD STAT'

Signal Off Error
'EXEC IOCP NEWIOCP2 (WRTA4 LPAR DYN IZP'
Say IOCP RC='rc
If rc \> 4 Then Do
 'ERASE NEWIOCP2 LISTING'
 'CP SET IOCDS A4'
End
Error:
erc = rc
'CP SPOOL CONSOLE STOP CLOSE'
Exit erc
```

# Did it Work?

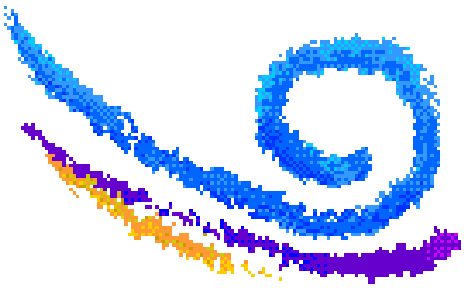
- Verify CHPIDs status

```
Query CHPIDS
        0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
    0x  +  .  .  .  +  -  +  +  .  .  +  .  +  +  +  +
    ...
    3x  +  -  +  +  +  +  +  +  +  +  +  +  .  .  .  .
    ...
    8x  +  -  +  +  -  .  .  .  +  -  +  +  +  +  +  +
    ...
    Bx  +  .  +  +  +  +  +  +  +  +  +  +  +  .  +  .
    ...
    Dx  .  -  .  .  .  .  -  .  -  .  .  .  +  +  +  +
    ...
    + Available
    - Offline
    . Not configured
```

# Did it Work?

- Query the paths to the device

```
Query PATHS 4000
    Device 4000 does not exist
```



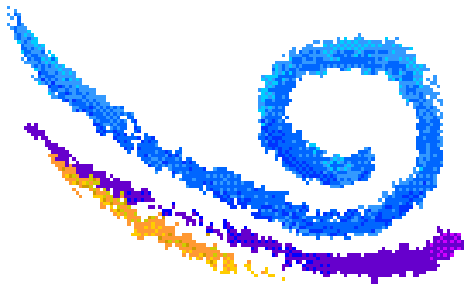
# The Last Step

- Vary the channel path online

```
vary on chpid 05
Channel path 0005 was successfully varied online
Device 4000 is available and online.
Device 4001 is available and online.
...

Device 407F is available and online.
```

- Query the devices

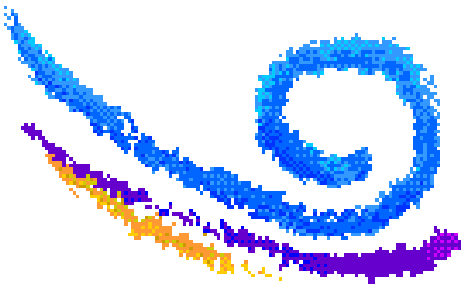
```
q 4000-407f
DASD 4000 IB4000, DASD 4001 IB4001, DASD 4002 IB4002, DASD 4003 IB4003,
DASD 4004 IB4004, DASD 4005 IB4005, DASD 4006 IB4006, DASD 4007 IB4007,
...
DASD 407C IB407C, DASD 407D IB407D, DASD 407E IB407E, DASD 407F IB407F
```



# Check it Out

- Verify CHPIDs status

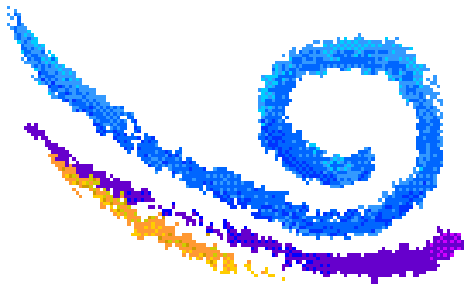
```
Query CHPIDS
        0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
    0x  +  .  .  .  +  +  +  +  .  .  +  .  +  +  +  +
    ...
    3x  +  -  +  +  +  +  +  +  +  +  +  +  .  .  .  .
    ...
    8x  +  -  +  +  -  .  .  .  +  -  +  +  +  +  +  +
    ...
    Bx  +  .  +  +  +  +  +  +  +  +  +  +  +  .  +  .
    ...
    Dx  .  -  .  .  .  .  -  .  -  .  .  .  +  +  +  +
    ...

    + Available
    - Offline
    . Not configured
```



# Check it Out

- Query the paths to the device

```
Query PATHS 4000
    Device 4000, Status ONLINE
     CHPIDs to Device 4000 (PIM)   : 05 31 89
      Physically Available (PAM)   : +  -  -
      Online               (LPM)   : +  -  -
                           Legend      + Yes - No
```



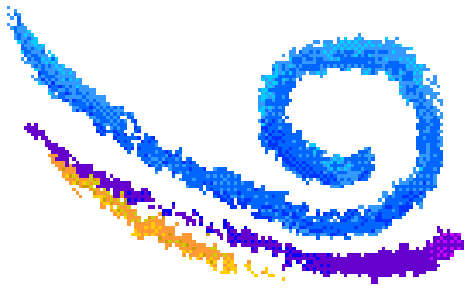
# Adding Another CHPID to the Control Unit



- IOCP

```
CHPID PATH=(31),SHARED,                                          *
      PARTITION=((SYC,VMB,VMC),(SYC,VMB,VMC)),SWITCH=01,         *
      TYPE=CNC
CNTLUNIT CUNUMBR=1440,PATH=(31,B1),UNITADD=((00,128)),           *
      LINK=(E1,E1),UNIT=3990
```

- Command to verify syntax
  - IOCP NEWIOCP3 (NOWRT DYN IZP LPAR

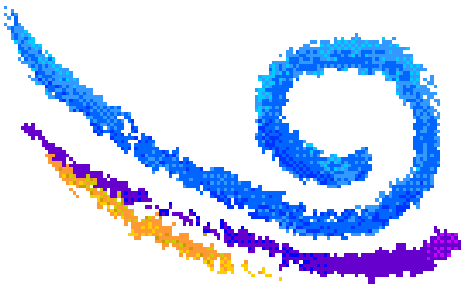


# Adding Another CHPID to the Control Unit



- Commands (in an EXEC)

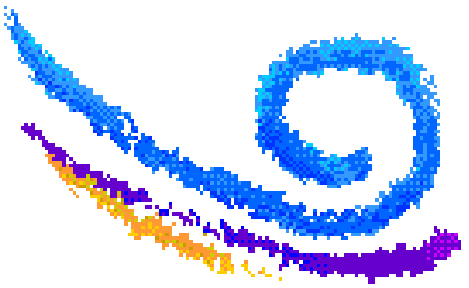
```
/* Dynamically add a CHPID to a DASD control unit */
Address 'COMMAND'
'CP SPOOL CONSOLE TO * START NAME DYNAMIC IOCP'
Signal On Error
Trace 'C'
'CP DEFINE CHPID B1 TYPE CNC SWITCH 01',
                  'SHARED ACC SYC VMB VMC INIT SYC VMB VMC'
'CP MODIFY CU 1440 CHPID 31 ADD CHPID B1 LINK E1'

Signal Off Error
 'EXEC IOCP NEWIOCP3 (WRTA0 LPAR DYN IZP'
 Say IOCP RC='rc
 If rc \> 4 Then Do
  'ERASE NEWIOCP3 LISTING'
  'CP SET IOCDS A0'
  End
Error:
erc = rc
'CP SPOOL CONSOLE STOP CLOSE'
Exit erc
```



# Did it Work?

- Verify CHPIDs status

```
Query CHPIDS
        0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
    0x  +  .  .  .  +  +  +  +  .  .  +  .  +  +  +  +
    ...
    3x  +  -  +  +  +  +  +  +  +  +  +  +  .  .  .  .
    ...
    8x  +  -  +  +  -  .  .  .  +  -  +  +  +  +  +  +
    ...
    Bx  +  -  +  +  +  +  +  +  +  +  +  +  +  .  +  .
    ...
    Dx  .  -  .  .  .  .  -  .  -  .  .  .  +  +  +  +
    ...
    + Available
    - Offline
    . Not configured
```



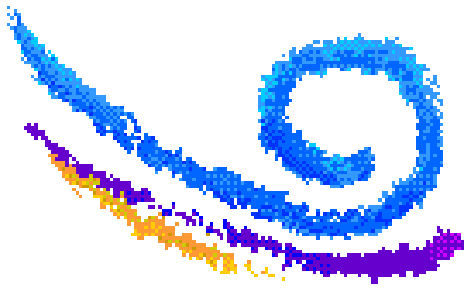
# The Last Step

- Query the paths to the device

```
Query PATHS 4000
    Device 4000, Status ONLINE
     CHPIDs to Device 4000 (PIM)   : 05 31 89 B1
      Physically Available (PAM)   : +  -  -  -
      Online               (LPM)   : +  -  -  -

                           Legend     + Yes - No
```

- Vary the other CHPIDs online

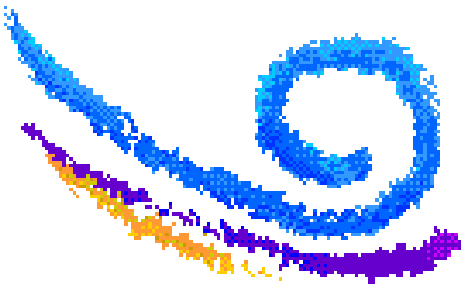
```
vary on chpid 31
Channel path 0031 was successfully varied online
vary on chpid 89
Channel path 0089 was successfully varied online
vary on chpid b1
Channel path 00B1 was successfully varied online
```



# Check it Out

- Verify CHPIDs status

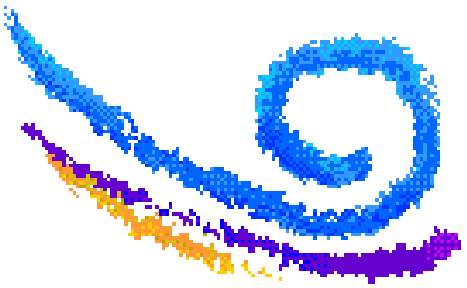
```
Query CHPIDS
        0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
    0x  +  .  .  .  +  +  +  +  .  .  +  .  +  +  +  +
    ...
    3x  +  +  +  +  +  +  +  +  +  +  +  +  .  .  .  .
    ...
    8x  +  -  +  +  -  .  .  .  +  +  +  +  +  +  +  +
    ...
    Bx  +  +  +  +  +  +  +  +  +  +  +  +  +  .  +  .
    ...
    Dx  .  -  .  .  .  .  -  .  -  .  .  .  +  +  +  +
    ...
    + Available
    - Offline
    . Not configured
```



# Check it Out

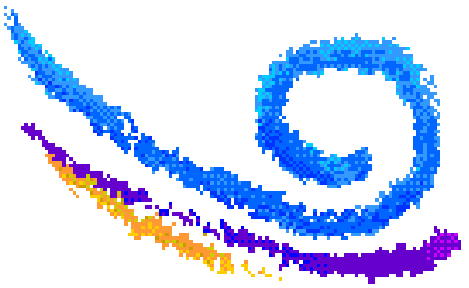
- Query the paths to the device

```
Query PATHS 4000
    Device 4000, Status ONLINE
     CHPIDs to Device 4000 (PIM)   : 05 31 89 B1
      Physically Available (PAM)   : +  +  +  +
      Online               (LPM)   : +  +  +  +
                           Legend     + Yes - No
```



# Removing Devices

- IOCP
  - Delete the macros for the devices to be removed from the IOCP source
- Command to verify syntax
  - IOCP NEWIOCP4 (NOWRT DYN IZP LPAR



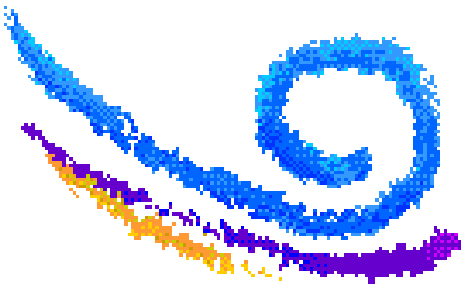
# Removing Devices...

- Vary the devices offline

```
vary off 4000-407f
4000 varied offline
...
407F varied offline
128 device(s) specified; 128 device(s) successfully varied offline
```

- Vary the subchannels offline

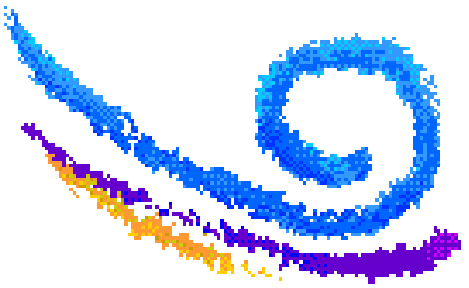
```
vary off subchannel 4000-407f
4000 subchannel varied offline
...
407F subchannel varied offline
128 device(s) specified; 128 device(s) successfully varied subchannel
offline
```



# Removing Devices...

- Commands (in an EXEC)

```
 /* Dynamically delete a DASD string */
 Address 'COMMAND'
 'CP SPOOL CONSOLE TO * START NAME DYNAMIC IOCP'
 Signal On Error
 Trace 'C'
 'CP DELETE DEVICE 4000-407F UNITADD 00 CU 1340'

  'CP DELETE CU 1340'
      'CP DELETE CU 1440'

  'CP DELETE CHPID 05'
  'CP DELETE CHPID 31'
  'CP DELETE CHPID 89'
  'CP DELETE CHPID B1'

 Signal Off Error
   'EXEC IOCP NEWIOCP4 (WRTA1 LPAR DYN IZP'
   Say IOCP RC='rc
   If rc \> 4 Then Do
     'ERASE NEWIOCP4 LISTING'
     'CP SET IOCDS A1'
   End
 Error:
 erc = rc
 'CP SPOOL CONSOLE STOP CLOSE'
Exit erc
```



# Did it Work?

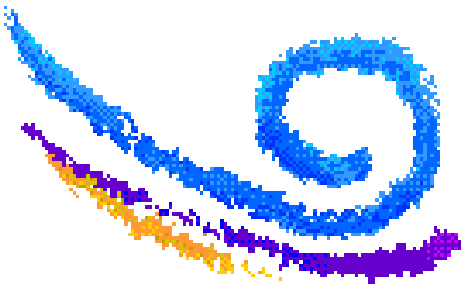
- Verify CHPIDs status

```
Query CHPIDS
        0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
    0x  +  .  .  .  +  .  +  +  .  .  +  .  +  +  +  +
    ...
    3x  +  .  +  +  +  +  +  +  +  +  +  +  .  .  .  .
    ...
    8x  +  -  +  +  -  .  .  .  +  .  +  +  +  +  +  +
    ...
    Bx  +  .  +  +  +  +  +  +  +  +  +  +  +  .  +  .
    ...
    Dx  .  -  .  .  .  .  -  .  -  .  .  .  +  +  +  +
    ...
    + Available
    - Offline
    . Not configured
```

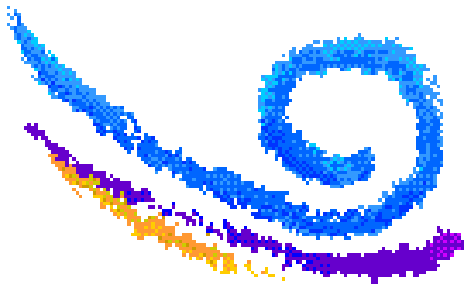
# Check it Out

- Query the paths to the device

```
Query PATHS 4000
    Device 4000 does not exist
```



# Summary



# Summary

- VM/ESA's dynamic configuration capabilities allow changes to be made while system remains up and running
  - System (CP) definitions and defaults
  - Hardware I/O definitions
  - CP Exits and customization functions
- Additional information:
  - VM/ESA Planning and Administration
  - VM/ESA CP Command and Utility Reference
  - VM/ESA System Operation
  - VM/ESA CP Exit Customization