

# OS/390 UNIX

## System Programming and Performance



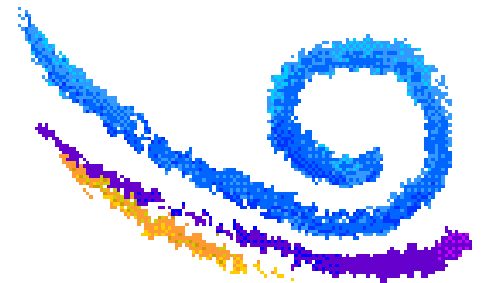
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IBM  
OS/390 UNIX and Language Environment Design

# Agenda

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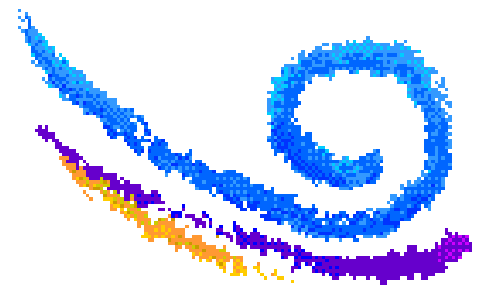
- ▶ The OMVS address space
- ▶ Changes in R3 and R4
- ▶ What you get with OS/390
- ▶ PARMLIB customization
- ▶ Service procedures
- ▶ Changes in R6 and R7



# The OMVS address space

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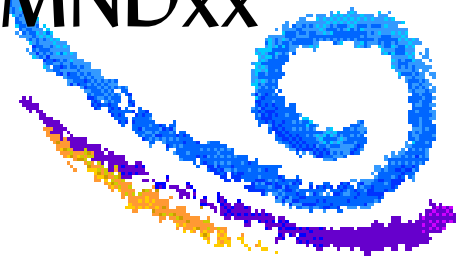
- ▶ The OMVS address space is what controls access and use of the OS/390 UNIX services.
- ▶ The BPXPRMxx PARMLIB member contains configuration information for the OMVS address space.
- ▶ This is where you would define:
  - Root filesystem
  - Other mounted filesystems
  - Settings for other keywords
- ▶ Can only bring up one OMVS per system.



# Prior to OS/390 R3

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- ▶ Customers need to issue the following operator commands, to start and stop the OMVS address space:
  - `s omvs,omvs=xx` where xx represented BPXPRMxx
  - `p omvs`
- ▶ In this timeframe, you cannot make dynamic changes to BPXPRMxx.
  - The only way to pick up changes is to stop and re-start the OMVS address space.
- ▶ Can add the **START** command to the COMMNDxx PARMLIB member.



# OS/390 R3 changes

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- ▶ The OMVS address space is now a permanent part of the operating system.
- ▶ Comes up automatically at IPL time, just like GRS, DUMPSRV, and XCF.

Why?

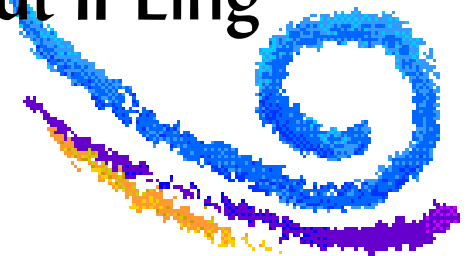
1. Other IBM products and vendors wanted to rely on OMVS and its services to always be available to prevent writing dual path code.
2. Increase performance, since we didn't need to initialize control blocks used during termination.



# OS/390 R3 changes ...

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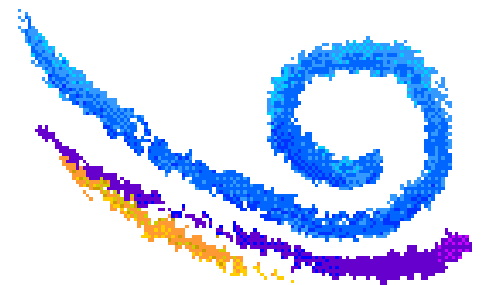
- ▶ Must now place **OMVS=xx**, in the IEASYSxx PARMLIB member.
  - The **START** and **STOP** operator commands no longer work.
- ▶ If no OMVS in IEASYSxx, or if **OMVS=DEFAULT**, then OMVS will come up in minimum mode.
  - Access to all OMVS services
  - Have a TFS (temporary file system) as the root
  - Can later move into full-function mode without IPLing  
(only if FILESYSTYPE statements are in place)



# OS/390 R3 changes ...

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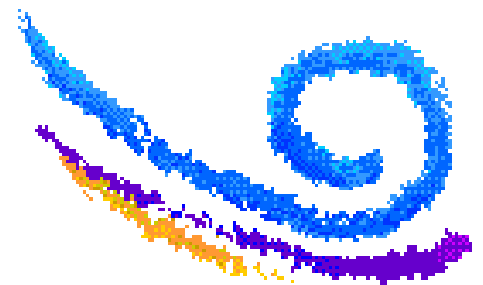
- ▶ A new PROC called **BPXOINIT** , placed in PROCLIB, is also used to make OMVS permanent.
- ▶ Dynamic changes to the BPXPRMxx member are now allowed using new operator commands:
  - **SETOMVS** - used to change individual keyword settings
  - **SET OMVS** (with blank) - to pick up changes via new BPXPRMxx members
  - There are still some settings that cannot be changed dynamically and require a re-IPL.
    - Cannot add FILESTYPE statements.



# OS/390 R3 changes ...

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- ▶ You can now also concatenate BPXPRMxx members on **OMVS=xx,yy,...** or on **SET OMVS=xx,yy,....**
- ▶ The root filesystem can be unmounted.
  - System programmers can use the TSO UNMOUNT command to unmount the current root filesystem and mount a new copy.
  - Unmounting root filesystem is like "pulling the rug" from every OMVS user.





# OS/390 R4 changes

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- ▶ We no longer use APPC initiators or the APPC scheduler for OMVS work.
- ▶ WLM is used to schedule OMVS activity and WLM initiators are used to perform the work.
  - Do not need to run in goal mode.
  - Can continue to use SRM and IEAIPSxx & IEAICSxx PARMLIB members to set priority for OMVS work.
- ▶ You will notice address space names of **BPXAS**
- ▶ WLM initiators stay around for 30 minutes before terminating.

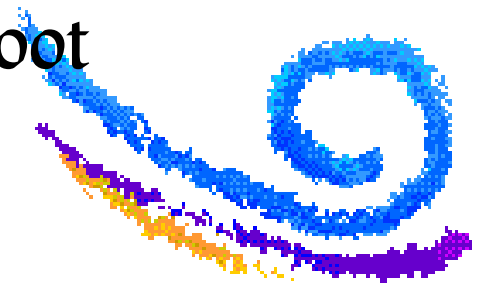


# What you get with OS/390

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## ▶ OS/390 ServerPac

- A "dumped" or "pax'ed" version of the HFS is provided.
- Also the pax utility is provided.
- Prior to OS/390 R6, you had different HFS data sets per element.
  - A different HFS for TCP/IP, WebServer, OS/390 UNIX Application services, etc....
  - You would have to run individual "restore" jobs for each HFS data set.
- In OS/390 R6, we now ship a consolidated root filesystem.
  - Also a separate HFS for /etc

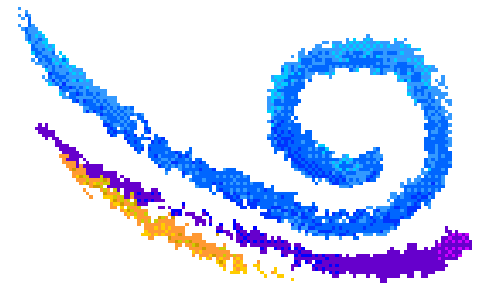


# What you get with OS/390 ...

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## ▶ OS/390 CBPDO

- System programmers must allocate the root HFS, in addition to other HFS data sets.
- In OS/390 R6, we now document to use a consolidate root filesystem for all elements of OS/390.
  - A new sample job called BPXISHFS is provided to allocate the consolidated root filesystem and a separate HFS for /etc.



# BPXPRMxx PARMLIB member

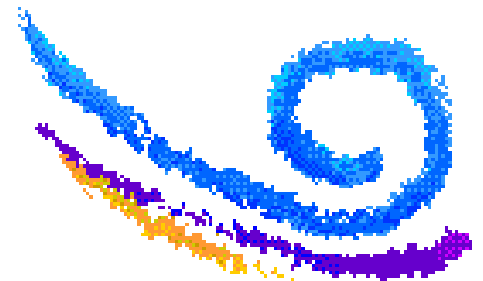
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## ▶ Sample could look like:

```
MAXPROCSYS (256)
MAXPROCUSER (16)
MAXUIDS(32)
MAXPTYS(256)
CTRACE(CTIBPX00)
FILESYSTYPE TYPE(HFS) ENTRYPOINT(GFUAINIT)
```

```
ROOT FILESYSTEM('SYS1.HFS.ROOT')
      TYPE(HFS)
      MODE(RDWR)
```

```
MOUNT FILESYSTEM('SYS1.HFS.ETC')
      TYPE(HFS)
      MODE(RDWR)
```



# Prior to OS/390 R4

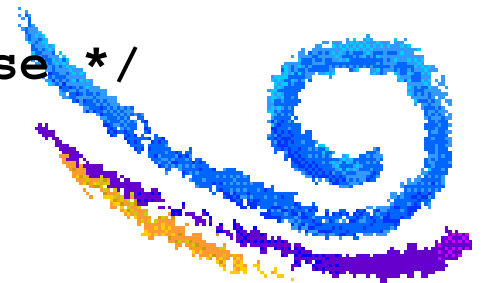
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## ▶ APPCPMxx member

```
LUADD ACBNAME(yyyyyyy) BASE TPDATA(xxxx.xxxx)
/* xxxx.xxxx - is the TP repository */
/* yyyyyyy - is defined in SYS1.VTAMLST */
```

## ▶ ASCHPMxx member

```
CLASSADD CLASSNAME(OPENMVS)
      MIN(5) MAX(25) RESPGOAL(1)
/* MIN too high wastes storage Initiators */
/* MIN too low may affect response time first use */
/* Set MAX at what your system can tolerate */
```

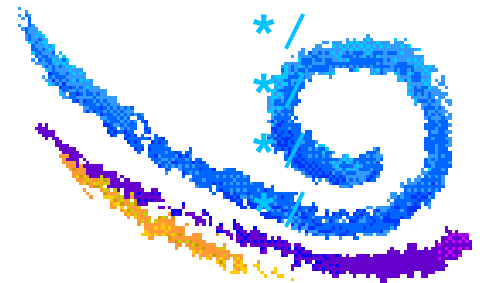


# Other PARMLIB changes

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- ▶ If not using WLM in goal mode:
  - Must set priority of OMVS work in **IEAIPSxx** and **IEAICSxx** PARMLIB members.
- ▶ Updates for VLF - COFVLFxx

```
CLASS NAME( IRRGMAP )      /* OS/390 UNIX-RACF GMAP table */
      EMAJ( GMAP )         /* Major name = GMAP          */
CLASS NAME( IRRUMAP )      /* OS/390 UNIX-RACF UMAP table */
      EMAJ( UMAP )         /* Major name = UMAP          */
CLASS NAME( IRRGTS )       /* RACF GTS TABLE            */
      EMAJ( GTS )         /* Major name = GTS           */
CLASS NAME( IRRACEE )      /* RACF saved ACEE's         */
      EMAJ( ACEE )        /* Major name = ACEE          */
```



# System Layout

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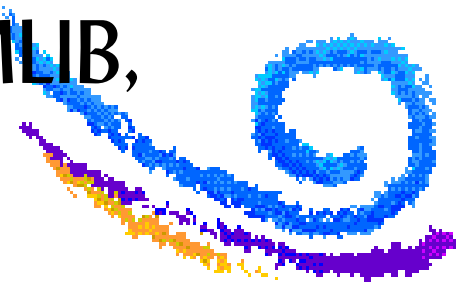
- ▶ Your OS/390 system is made up of:
  - Target data sets residing on two or more SYSRES volumes.
  - Distribution data sets residing on two or more volumes.
  - The CSI - target and dlib zones
  - Your system HFS data set(s) residing on an SMS managed pack.



# Service Procedures - Cloning

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1. Move the Target and Distribution data sets as usual:
  - Use DFDSS
    - Full volume dump **OR**
    - Dump by data set
2. Move over the CSI as usual:
  - Use IDCAMS, if not on target or DLIB packs.
3. Use DFDSS to DUMP the HFS data sets to sequential data sets.
4. Move over operational data sets (ie. PARMLIB, PROCLIB).

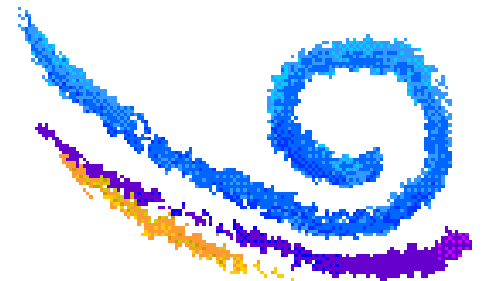




# Sample DUMP JCL:

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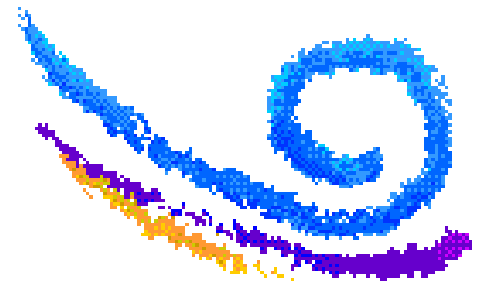
```
/**
//* INPUT HFS NAME: SYS1.OMVS.ROOT
//* OUTPUT SEQ NAME: SYS1.OMVS.ROOT.SEQ
/**
//DSSDUMP EXEC PGM=ADRDSSU,TIME=60,REGION=4096K
//SYSPRINT DD SYSOUT=*
//SYSABEND DD SYSOUT=*
//DD1 DD UNIT=3390,VOL=SER=SMS001,DISP=SHR
//OUT DD DSN=SYS1.OMVS.ROOT.SEQ,
// DISP=(NEW,CATLG,DELETE),
// UNIT=3390,SPACE=(CYL,(20,10)),VOL=SER=DMP001
//SYSIN DD *
DUMP LOGINDDNAME(DD1) OUTDD(OUT) -
COMPRESS SHARE OPT(4) -
DATASET(INCLUDE(SYS1.OMVS.ROOT)) -
ALLEXCP ALLDATA(*) TOL(ENQF)
```



# Sample RESTORE JCL:

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```
//*****  
//* INPUT SEQ NAME: SYS1.OMVS.ROOT  
//* OUTPUT HFS NAME: Will create SYS1.OMVS.ROOT, in  
//* STORCLAS=SMS1 and will rename it to  
//* SYS1.PRODA.ROOT  
//*****  
//DSSREST EXEC PGM=ADRDSSU,TIME=60,REGION=4096K  
//SYSPRINT DD SYSOUT=*  
//SYSABEND DD SYSOUT=*  
//DD1 DD DSN=SYS1.OMVS.ROOT.SEQ,DISP=SHR,  
// UNIT=3390,VOL=SER=DMP001  
//SYSIN DD *  
RESTORE DATASET(INCLUDE(SYS1.OMVS.ROOT)) -  
INDD(DD1) TOL(ENQF) STORCLAS(SMS1) -  
RENAMEU(SYS1.OMVS.ROOT,SYS1.PRODA.ROOT) -  
REPLACE CATALOG
```



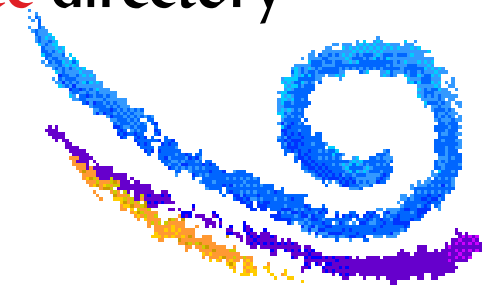
# Alternatives

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- ▶ An alternative to Step3, could be to dump the SMS managed pack. However, this assumes the target system has the same SMS policy and ACS routines.

## Other Hints and Tips

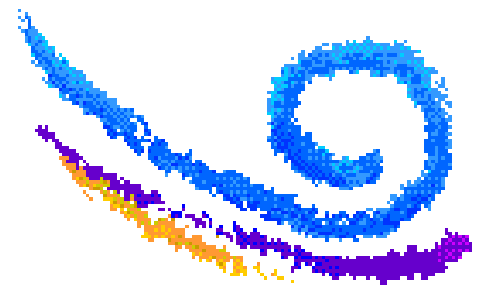
- Some customers use the target zone name as one of the qualifiers of the HFS data set name(s).
- Some customers, use the system name as one of the qualifiers.
- Maintain a separate HFS for */etc* directory. The */etc* directory contains customization information which could be site specific.



# Cloning ...

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- ▶ For target and distribution data sets, you would:
  - Use SMP/E ZONEEDIT facility to change the UNIT and VOLSER of DDDEF statements
- ▶ For PATH statements, you need to "make it available"
  - Create a new mountpoint (ie /OS390R5). This is what we know and document as the /SERVICE process.
- ▶ Use SMP/E ZONEEDIT facility to change the **'PathPrefix'** of all DDDEFs to match that of your mountpoint.

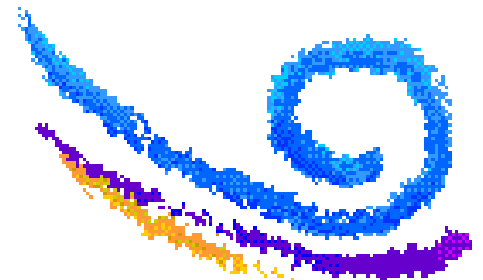


# Sample ZONEEDIT:

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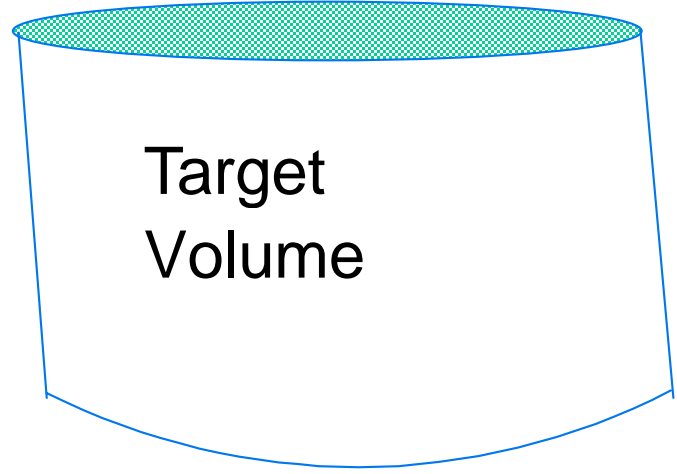
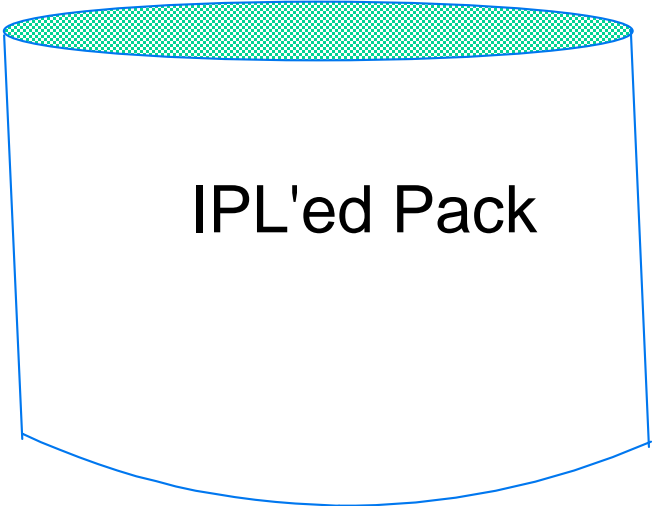
```
/** Change the two occurrences of the string -PathPrefix- to
/** the appropriate high level directory name. Please note
/** the replacement string for -PathPrefix- is case
/** sensitive and should end in a slash (/).
/**
/** The first ZONEEDIT will change all DDDEF PATH= back
/** to the root. The second will change them back.
/**
    SET BDY(tzone)
    ZONEEDIT DDDEF.
    CHANGE PATH('-PathPrefix-','*
                '/' '*).
    ENDZONEEDIT.

    SET BDY(tzone)
    ZONEEDIT DDDEF.
    CHANGE PATH('/' '*,
```



IPL'ed System CSI

Target CSI



SYS1.HFS.ROOT

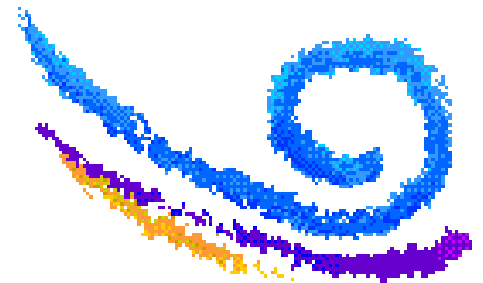
SYS1.HFS.TARGET



# Dynamic /dev

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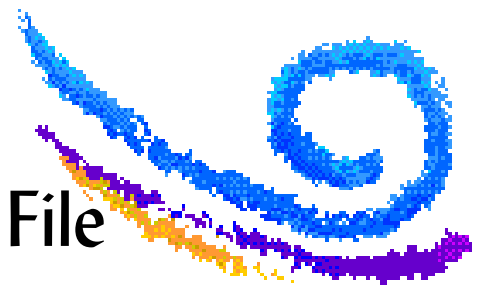
- ▶ **Problem Statement / Need Addressed:**
  - The standard /dev files must be defined through a REXX exec prior to installation.
  - Additional files must be defined if limits are raised.
- ▶ **Solution:**
  - Dynamically create these files as needed in R7.



# Dynamic /dev Overview

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- The following types of files will be created the first time they are referenced:
  - ▶ /dev/ptypNNNN - pseudo-TTY Master
  - ▶ /dev/ttypNNNN - pseudo-TTY Slave
  - ▶ /dev/fnN...N - File Descriptor Files (c89)
- The following files will be created the first time the system is IPLed:
  - ▶ /dev/null - The Bit Bucket
  - ▶ /dev/console - The Console (WTO) File
  - ▶ /dev/tty - The Controlling Terminal File





# Dub Home Directory

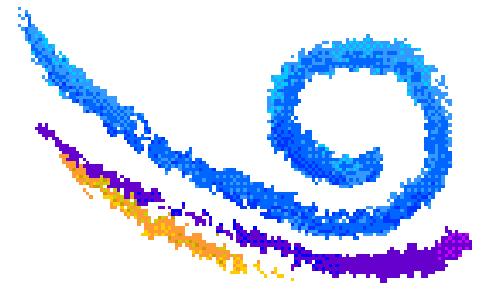
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## ▶ Problem Statement:

- If there is something wrong with a user's home directory, that user can't use Unix services to fix the problem.

## ▶ Solution:

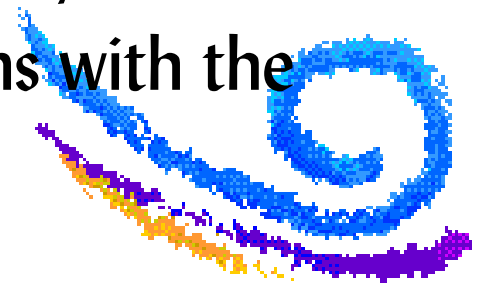
- Allow a user without a valid home directory to use Unix services in restricted mode. Changes have been made in R7.



# Dub Home Directory Overview

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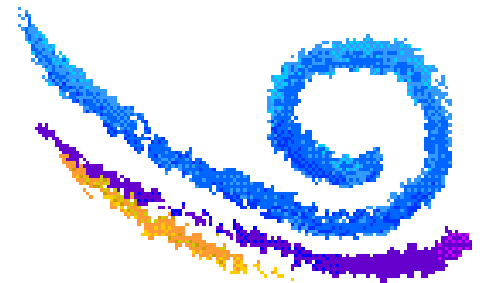
- If the system can't use the specified home directory, the user will be allowed on without a current working directory (CWD).
- All file references must be with absolute pathnames, i.e. /a/b/d
- This allows one to:
  - ▶ Issue TSO MOUNT to mount the HFS that contains the home directory.
  - ▶ Issue TSO MKDIR to create the home directory.
  - ▶ Use the ISPF ISHELL to create or fix problems with the home directory.



# BPX.SUPERUSER Exploitation

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- ▶ System programmers no longer need to be a hardcoded UID=0 to do install and other system programmer activity for OS/390 UNIX - in R7.
  - The TSO **MOUNT** and **UNMOUNT** commands have been changed to support the BPX.SUPERUSER facility class.
  - **SMP/E** has been changed to support BPX.SUPERUSER facility class.



# ServerPac Improvements

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- ▶ **In OS/390 R6 - Shipment of a single root file system.**
  - A single root filesystem saves on the number of 'RESTFS' jobs you need to run. You no longer have a filesystem for TCP/IP, DCE, Webserver, etc... In addition, a single root HFS allows for easier management when cloning your system.
- ▶ **In OS/390 R7 - Restoring the HFS from the driving system.**
  - In OS/390 R7, during the ServerPac install, you will no longer need to stop your installation and IPL your system to restore the HFS. If your driving system is at least OS/390 R4, and you have SMS and OMVS active, you will be able to restore the HFS from the driving system. When you IPL your new system, OMVS will be active with the new root.

