Novell Network Services 4.1

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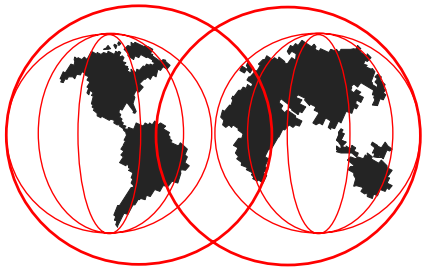

Product Details

- Separate program product, no charge
- GA - 2/26/99
- 1st release offers Network Directory Services (NDS)
- Program number 5655-B12
- SMP/E installable
  - FMID JBB6616 - STREAMS code, in linklib
    - compid 564701NWS
  - FMID HNWS110 - NCPS code, IPX/IP driver code
    - compid 5752SCNSS
    - NCPS code in HFS, linklib
    - driver code in linklib

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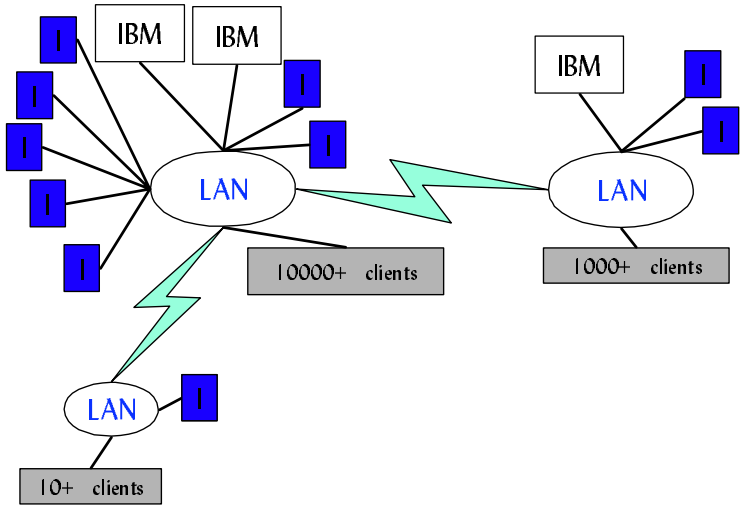
- Novell Cross Platform Services (NCPS) - Novell's UNIX operating system code
- Ported to OS/390, utilizing UNIX System Services, including STREAMS support
- product name is Novell Network Services 4.1 on OS/390 (referred to as NNS in foil package)
- NDS - Novell's core directory service for administrating network objects in a distributed database

Network environment



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- Diagram represents a possible network environment (note that LANs are Ethernet even though ovals typically are token ring)
- IBM are S/390 images running NNS
- I's are InternetWare servers
- largest LAN could be headquarters, middle LAN could be smaller regional center over WAN links, and smallest LAN could be branch office
- S/390 servers could hold replicas for several partitions, thus eliminating need for additional servers

NWS Functions

- Another directory structure for OS/390
- Customer support for central and hierarchical management of users, groups, networks, security and applications
- NetWare/IP support in addition to IPX support
- No Front End Processor (FEP) required
- Acts as NDS server for NetWare PC clients/browsers

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- NDS provides global naming service distributed across entire NetWare network with single point of administration
- users log into Directory tree and, with appropriate rights, have access to any resource on the network regardless of physical location
- NDS provides:
  - distributed information service which stores many types of data
  - scalability & reliability due to partitions/replicas
  - single sign-on that give single point of identification to the network
  - extensible schema, enabling an application developer to customize Directory information
  - Files services - multiple name spaces (uses naming conventions of w/s o/s) and multi-level file access (through trustee assignments to users/groups, inherited rights and file attributes)
  - Client support & utilities - allows w/s to share networked resources
  - Account security - provides secure NDS authentication with private key/public key encryption login restrictions

NWS Functions (cont.)

- Acts as router for other servers
- Transparent to administrators and users
- Clients supported: Win95, WinNT, DOS32
- Frame types supported: Ethernet 802.2, Ethernet II, Ethernet Snap
  - need router to support other LAN/frame types
- Base for future releases with V5 compatibility, file/print serving, RACF integration, LDAP integration, NetWare APIs

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- Clients must be 32-bit for NNS support - these three client O/Ss have been tested

Software/Hardware Requisites

- Minimum requisites - Hardware:
  - IBM 9672 Parallel Enterprise Server Model G3 (for IPX) or G2 (for NetWare IP) or later model
  - (for IPX) Fast Ethernet OSA-2 feature
- Minimum requisites - Software
  - OS/390 Version 2 Release 6 (FMID HBB6606) or a later release
    - OS/390 2.6.0 BCP apar OW34660
    - UNIX System Services (FMID HOT1180) with apar OW34480 or higher
    - If OSA-2 feature used, require OSA/SF V1R2 (FMID H0G1200) with apar OW33393
  - Security Server feature enabled

- models G2 and above are needed for PLO instruction support
- OSA-2 only supported on G3 and above
- RACF Security Server feature is verified via Enable/Disable checking (parmlib member IFAPRDxx)

Parmlib members

- IFAPRDxx
  - verifies RACF Security Server feature enabled and file serving feature disabled:

```
PRODUCT OWNER('IBM CORP')
        NAME(OS/390)
        ID(5647-A01)
        VERSION(*) RELEASE(*) MOD(*)
        FEATURENAME('SECURITY SERVER')
        STATE(ENABLED)

PRODUCT OWNER('IBM CORP')
        NAME(OS/390)
        ID(5647-A01)
        VERSION(*) RELEASE(*) MOD(*)
        FEATURENAME('NETWARE FILE SRV')
        STATE(DISABLED)
```


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HFS requirements - base install

- minimum size 4,492 tracks on 3390 to install
  - reference: UNIX System Services Planning - GC28-1890
- sample jobs provided:
  - found in SMPTLIB: 'prefix.IBM.HNWS110.F1'
  - INRALLOC - allocate NNS target/distribution libs
  - INRDDDEF - define NNS DDDEFs
  - INRISMKD - create HFS directories for NNS

- 'prefix' is high-level qualifier value specified as the DSPREFIX value in the SMPTLIB DDDEF or the OPTIONS entry in the global zone
- make a copy of these jobs in your own library and modify them to use during installation
- sample jobs must be updated to specify the CSI and zone names used at your installation

Protocols: IPX & NetWare/IP

- IPX protocol - communication method between clients and servers in a Novell network
- IPX can travel directly on the wire or be encapsulated within TCP/IP (NetWare/IP)
- NetWare/IP requires:
  - Domain Name Server (DNS)
  - Domain SAP/RIP Service (DSS)
  - DNS/DSS not included in NNS
  - NetWare/IP requires its own domain
- IPX requires Fast Ethernet OSA-2 installed on system
  - multiple OS/390 images can share same card

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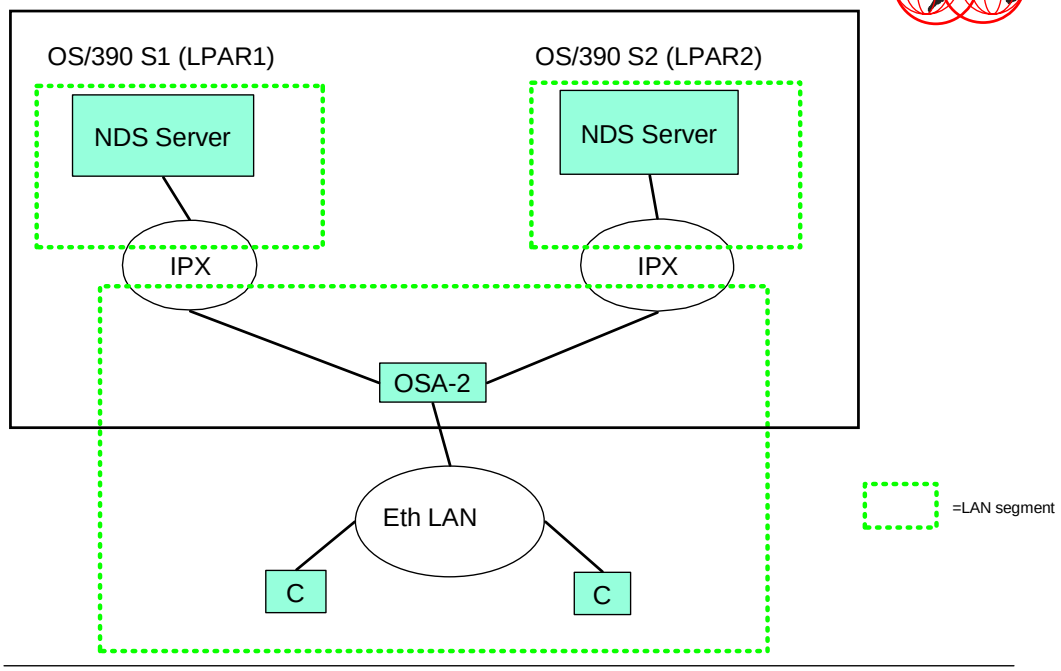
- Internet domain - administrative unit, element in DNS (Domain Naming System), a naming hierarchy
- top level domain - 7 organizational: com, edu, gov, int, mil, net, org
- DNS - provides a machine's IP address given domain name (host-to-address mapping)
- DSS - maintains and distributes SAP and RIP information for the NWIP network
- Forwarding Gateway - NWIP server which forwards SAP and RIP info into the NWIP network
- NetWare/IP domain like any other except cannot have subdomains or hosts; it becomes a logical domain for all the NWIP servers on the network regardless of physical location
- RIP (Routing Information Protocol) packet - used by routers and servers to exchange routing information on a network
- SAP (Service Advertising Protocol) packet - used by NetWare services to broadcast their availability across the network

NNS networking



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- Diagram shows OSA card shared between two OS/390 images in different LPARS
  - blue represents LAN segment, with its own unique network number
  - server has internal network number
  - must configure manually with nwcm
  - LAN has external network number
  - can extract with nwdiscover, or enter if this is 1st server in the network (recommended)

NetWare/IP Configuration

- NetWare IP consists of server and client software which enables servers/clients to use TCP/IP
- Both servers and clients must be configured to use IP
- Required for NetWare/IP server configuration:
  - Domain Name System (DNS) - centralized database of host-to-address mapping
  - Domain SAP/RIP Service (DSS) - maintains/distributes SAP/RIP info for the NetWare/IP network
  - Forwarding Gateway - NetWare/IP server which forwards SAP/RIP information into the NetWare/IP network
  - Can all be the same server
- Requires special NetWare/IP domain be created
- Requires unique IPX external network number is assigned

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- all NWIP servers in the same domain must be configured with the same IPX external network number - used by IPX networks and the NWIP network
- required character special file /dev/nwip is created automatically by NNS and is used when configuring the nwcm lan_x_adapter parameter
- DSS requires NetWare 4.11 Support Pack #5 to work with NWIP

Some NNS Terminology

- NDS directory tree - hierarchical structure of objects in the Directory database, can be logically structured
- Partition - a logical division of the Directory's global database, forms a distinct unit of data in the tree used to store and replicate Directory information
  - Each partition consists of a container object, all objects contained in it, and data about those objects
  - Partitions don't include information about the file system or the directories and files contained there
- Replica - a physical copy of a Directory partition
  - should have a minimum of three replicas on different servers
  - Types: Master (only one allowed), Read-write, Read-only
- Synchronization - periodic update of replicas for database consistency

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- Trees and partitions are logical constructs, whereas replicas are physical constructs
- Replicas serve two purposes: backup (eliminate single point of failure), and faster access (eg. across WAN link)
- Master replicas used for creating new partitions, adding/deleting objects
- Read-write replicas used to update Directory info
- Read-only replicas used to view Directory info
- Synchronization info can be set via nwcm, eg.
- $ nwcm -s ts_polling_interval= number

Key Administration Commands

- Reference: Novell NetWare Services Utility Reference - GA22-7318
- commands issued from omvs, in /usr/lpp/netware/bin
- startnps - initializes NetWare protocol stack (IP/IPX)
- nwdiscover - optional, determines IPX network characteristics
- nwcm - configures server variables
- nwserver - brings up the NetWare Services engine
- dsinstall - required for 1st bringup, creates NDS tree
- nwshut - brings down NetWare Services engine
- stopnps - brings down NetWare protocol stack

Installation of NNS server

- Log into OS/390 UNIX System Services:
  - must have superuser authority
  - update PATH and NLSPATH variables:
    - $ export PATH=$PATH":/usr/lpp/netware/bin"
    - $ export NLSPATH=$NLSPATH":/usr/lpp/netware/nls/msg/C/%N"
- Set up SYS volume:
  - nwvm -R SYS - creates SYS volume in /etc/netware/vol/SYS
  - can also copy client utilities to SYS volume via
    - $ cp -R /usr/lpp/netware/SYS /etc/netware/vol/SYS
- Configure the LAN:
  - if NOT 1st NetWare server in LAN, use nwdiscover to query and update NNS configuration
  - $ nwdiscover -auv

- login: log onto TSO/E and enter OMVS command; or can use rlogin or telnet
  - superuser - use root or equivalent id
  - to display PATH/NLSPATH current values:
  - $ echo $PATH (or $NLSPATH)
  - can add these to profile/login script of your id
  - make sure HFS for SYS vol already exists and is mounted (review procedure above)
  - nwdiscover parms -a (check all frame types) -u (update config file) -v (view in verbose mode)

NNS Server Installation (cont.)

- if 1st NetWare server in LAN, follow installation worksheet (see Installation Guide) with nwcm for the following parameters:
  - lan_1_adapter - set to device file (character special) name
  - $ nwcm -s lan_1_adapter="device_file_name"
  - lan_1_frame_type - set to appropriate Ethernet frame type
  - $ nwcm -s lan_1_frame_type="frame_type"
  - lan_1_network - set to external network number you have defined - must be unique for network (both internal & external)
  - $ nwcm -s lan_1_network="external_network_number"
- Assign an internal network number:
  - $ nwcm -s ipx_internal_network=0xnnnnnnnn
- Name the server, eg.:
  - $ nwcm -s server_name=NNS001
- Establish time synchronization type:
- $ nwcm -s ts_type="Single"

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- worksheet has:
  - server_name - where NWS is advertised, 2-47 chars, no spaces or punctuation, will be converted to uppercase
  - ipx_internal_network - network address of internal network (LAN 0) - must be unique on IPX network, values 0x1 to 0xFFFFFFFE, can enter in hex (0xNNNNN) oct 0NNNN) or dec (NNNNN)
  - ts_type - how server synchronizes time and is initially set
  - SINGLE - smaller lans, sole time source
  - REFERENCE - larger LANs, time source for Primary/Secondary servers
  - PRIMARY - used with Reference server or other Primary servers
  - SECONDARY - obtain time from Single Reference, Reference or Primary server
  - NOTE: OS/390 only appears to change its clock!!
  - - lan_x_adapter - name of device driver (for NWIP, set to "/dev/nwip", max len 127, must also configure lan_x_network
  - lan_x_network - specifies IPX external network number for cabling system - all IPX drivers linked to cabling system must use same network number

NNS Server Installation (cont.)

- Start the network protocol stack: $ startnps
- Start the license manager: $ lsman
- Start the server: $ nwserver
  - wait for message: ALL PROCESSES ARE UP
- Configure NDS using dsinstall: $ dsinstall
  - If installing a new NDS tree, enter option 2
  - If adding the server to an existing tree, enter option 3
  - Enter NDS tree name
  - Enter context (option 2 only) in all caps, eg. O=IBM
  - Enter admin password (will prompt to repeat)
  - Verify the state of the server: $ nwserverstatus
    - should indicate server is up
    - if not, review installation, make sure all steps followed

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- Complete message:
- ALL PROCESSES ARE UP, THE SERVER IS READY
- NetWare server (name) is waiting for Directory Services to be installed. To finish bringing up the server you must run dsinstall.

Installing Client Software

- To continue setting up the network, must install a client
- From there, can run either NetWare Administrator (NWADMIN) or NETADMIN to start creating objects
- Access to installation diskettes:
  - download client software from Novell web-site
  - http://support.novell.com/home
  - ensures using the latest level of Novell client code
  - check under topic NetWare Clients and obtain appropriate software for your workstation operating system

Publications

- Reference: http://www.s390.ibm.com/os390
- Novell NetWare Services LPS - GA22-7361
- Novell NetWare Services Installation - GA22-7312
- Novell NetWare Services Concepts - GA22-7313
- Novell NetWare Services Introduction to NDS - GA22-7314
- Novell NetWare Services Messages - GA22-7316
- Novell NetWare Services Supervising the Network - GA22-7317
- Novell NetWare Services Utility Reference - GA22-7318
- Novell NetWare Services Schema Reference - GA22-7342
- Planning for the OS/390 Open Systems Adapter Feature - GC23-3870