



SuSE Linux Enterprise Server 8  
... the power of United Linux

**SuSE LINUX AG**

**THE LINUX EXPERTS**

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# Abstract

- IBM's Boeblingen lab first made their, for the support of the S/390 architecture necessary, changes and additions to the Linux kernel publicly available in late 1999. Since then many features have been added and many improvements been built into Linux kernels which resulted in dramatically increased performance and usability of these due to the higher level of integration with the platform and better utilization of the HW capabilities. A number of recently added features and changes will be presented, amongst these: async I/O, multipath I/O and SCSI device support.

# Agenda

- SuSE Linux Enterprise Server for S/390 and zSeries - An Overview
- Current Features and Benefits
- Applications
- Q&A

# History

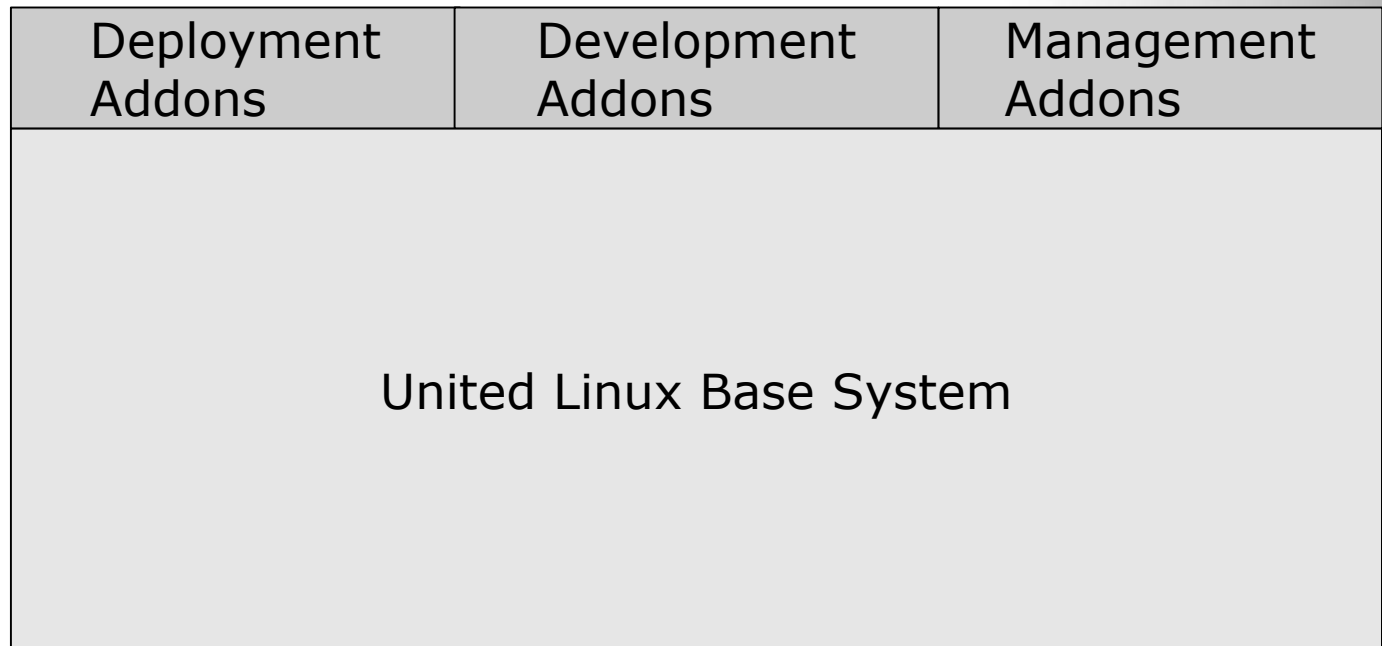
- Dec1999 First code drop from IBM to open source
- H1 2000 Linux S/390 from Marist College
- Jul 2000 IBM install fest SuSE Linux 6.4 beta S/390
- Oct 2000 SuSE Linux Enterprise Server (1) for S/390  
aka SuSE Linux 7.0 for S/390
- Oct 2001 SLES 7 for IBM S/390 and IBM zSeries(31bit)
- Apr 2002 SLES 7 for IBM zSeries (31/64bit)
- Nov 2002 SLES 8 for IBM S/390 and IBM zSeries(31bit)
- Nov 2002 SLES 8 for IBM zSeries (31/64bit)

*... powered by United Linux*

# The Power of United Linux

- United Linux: joint effort of Connectiva, SCO, SuSE, TurboLinux
- Planning started mid March 2002
- Spec UL 1.0 ready May 15<sup>th</sup> 2002
- Implementation started June 2002
- Connectiva engineers joined July 2002
- First preview snapshot mid July 2002
- Turbo engineers joined mid August 2002
- First beta snapshot mid August 2002
- Goldmaster S/390 and zSeries November 2002
- GA Nov 19<sup>th</sup> 2002: x86, s390, ipzSeries, IPF (pending)

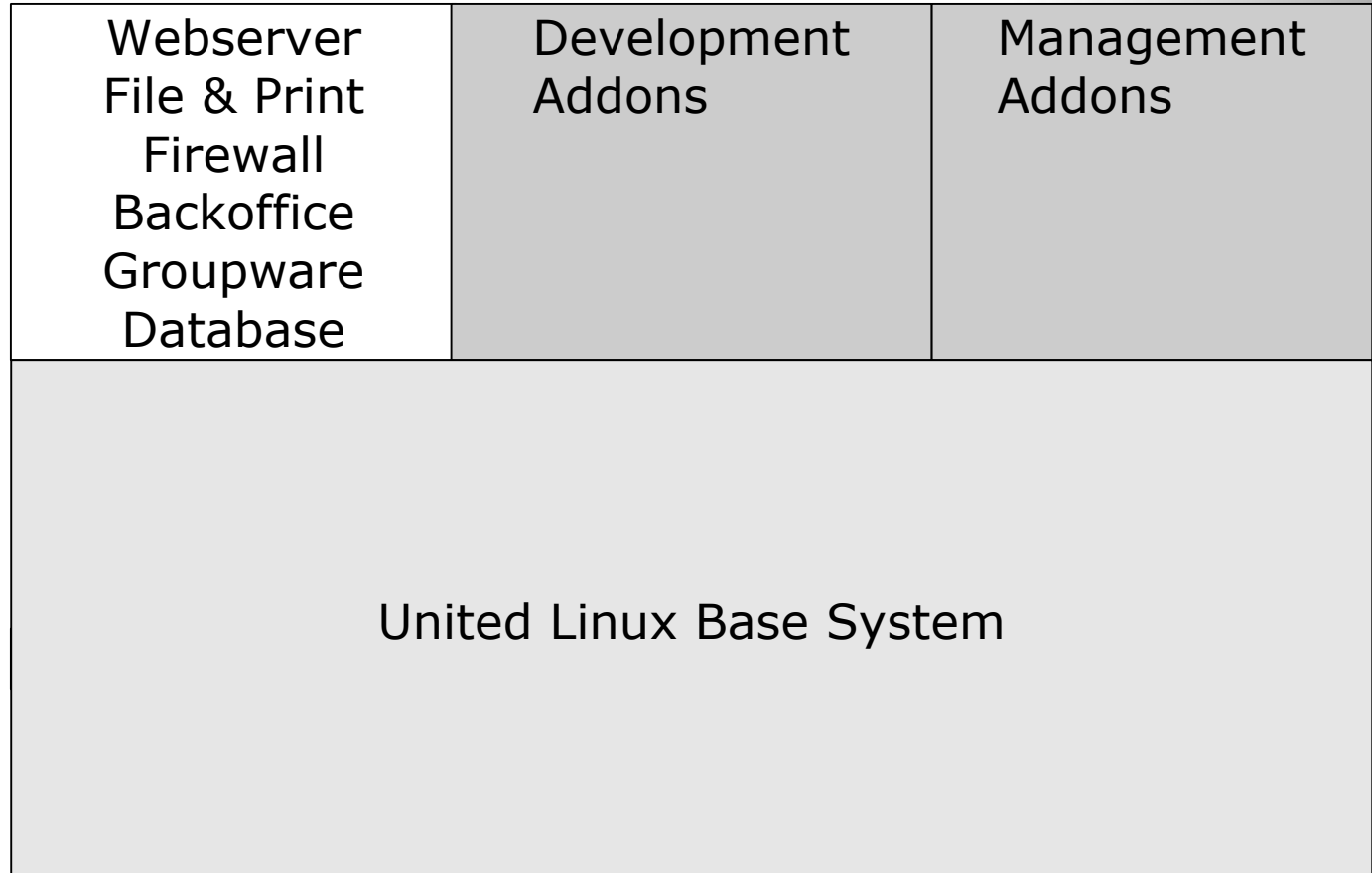
# Architecture



# United Linux Base System

Deployment Addons	Development Addons	Management Addons
Graphical Console (X11, KDE, Gnome, Web)		
United Linux Enterprise Features		
Standards Compliance (FHS, LSB, Li18nux, GB18030)		
United Linux Enterprise Kernel		

# Deployment Addons





# Development Addons

Deployment Addons	Training Developer program SDK Devel Profile	Management Addons
United Linux Base System		

# Management Addons

Deployment Addons	Development Addons	Consulting SmartClient AutoYaST2 YaST2
United Linux Base System		

# SLES powered by UL

SLES for S/390 & zSeries

S/390 & zSeries  
specific features

Generic SLES Features

United Linux Base  
System

SLES for zSeries

S/390 specific libraries  
for 31/64bit apps  
support

S/390 & zSeries  
specific features

Generic SLES Features

United Linux Base  
System

# UnitedLinux Features...

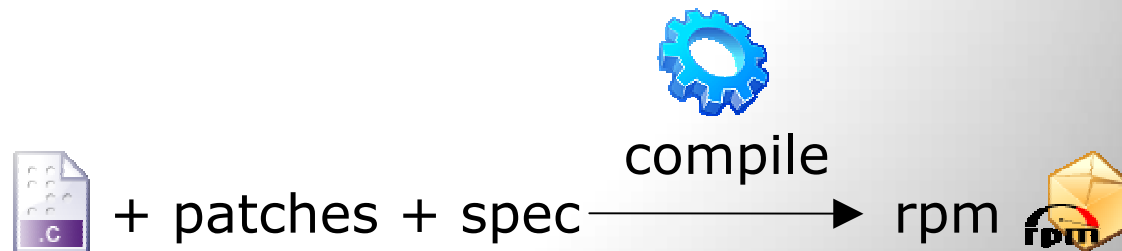
- Common code base (sources)
- Common base system (system layout)
- Common installer (install & setup)
- Global expertise
  - Kernel expertise (2.4 and 2.6 maintainers)
  - glibc expertise
  - Localization
- Engineering around the clock
- Manpower
  - Biggest Linux engineering team
  - Synergies with other groups

## ...UnitedLinux Features

- Multiple architectures (6), 7 platforms
  - Available on x86, x86-64, IPF, ipzSeries, S/390
- Standards based: LSB, Li18nux, GB18030 (enabled)
- Multi language: en, de, es, fr, itl, jap, chin ...
- Improved Interoperability
- Easier Serviceability
- New Functionality
- Better Scalability
- More Certifications

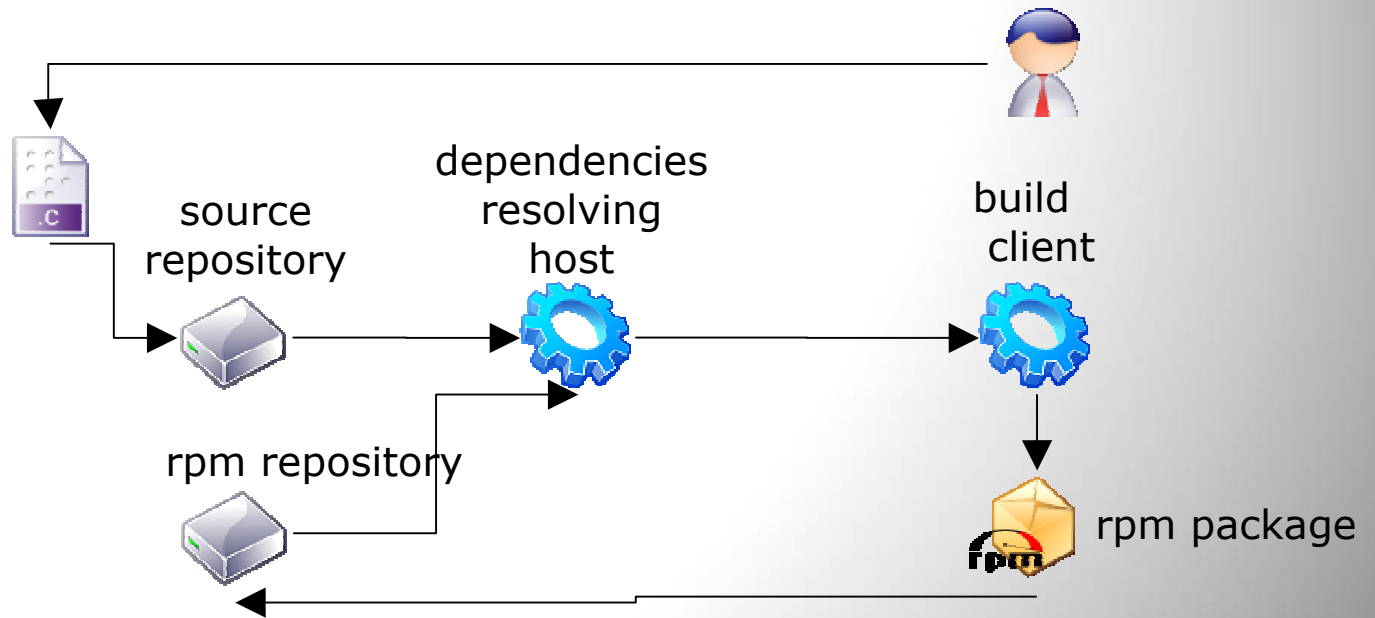
# Common Code Base

- UL kernel 2.4.19
  - UL kernel = kernel.org + UL patches
- Glibc 2.2.5
- GCC 3.2 and suitable toolchain (binutils, debugger)
- UL common packages (base system, system tools, apps)

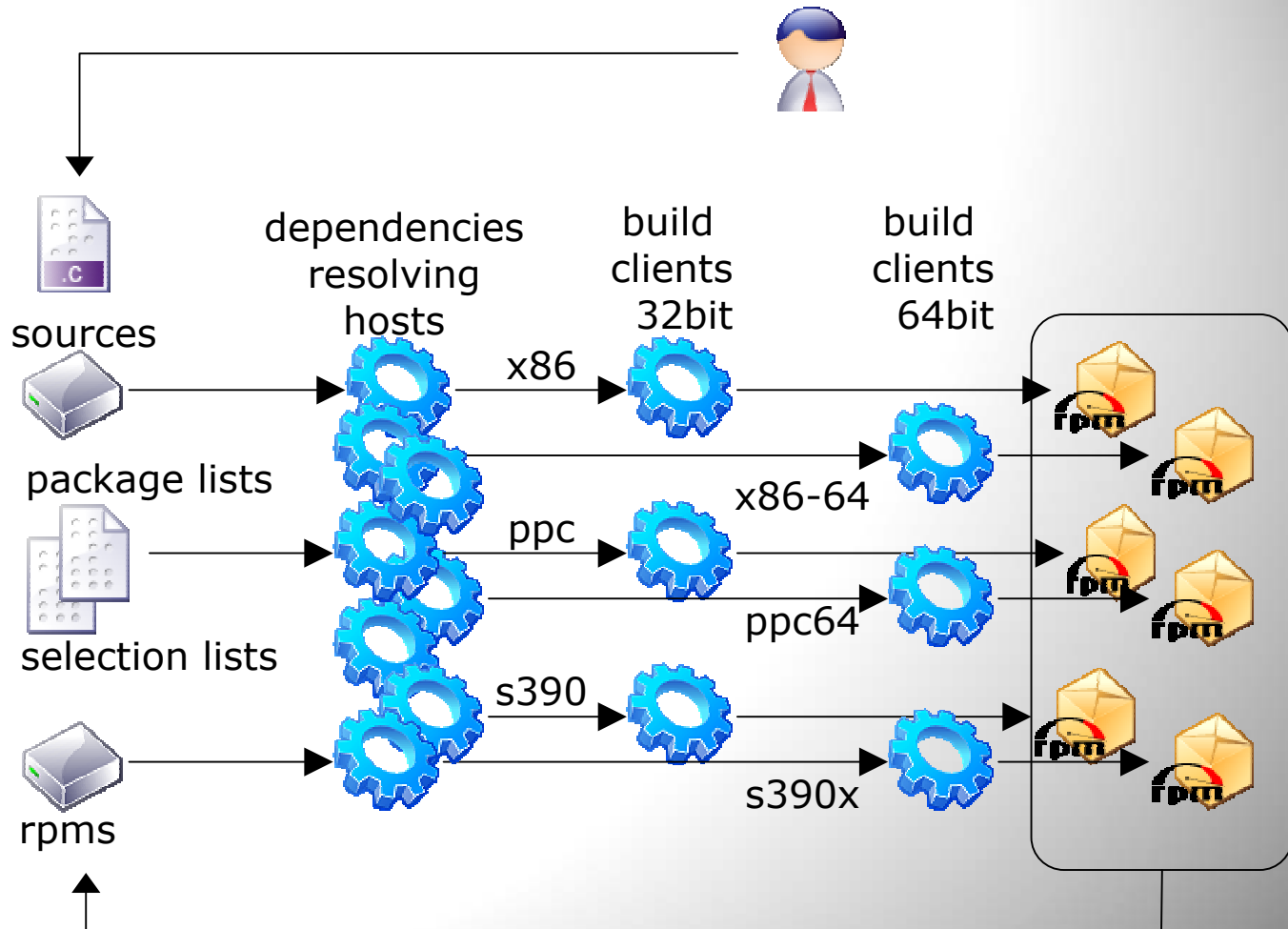


# Consistent Package Building

- rebuilding packages in self-hosting environment



# Multi-Arch Package Building

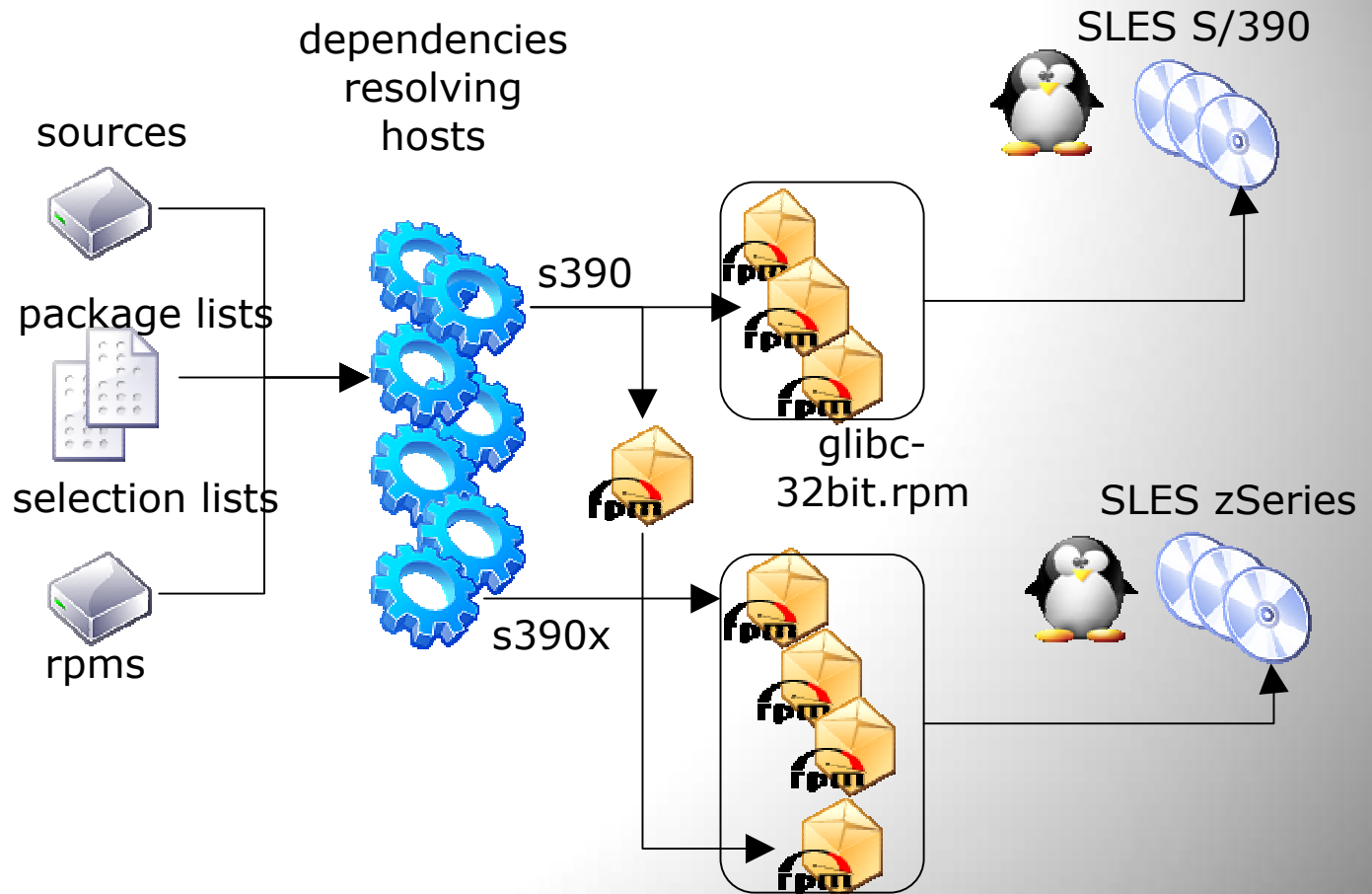




# Multi-Library System Building...

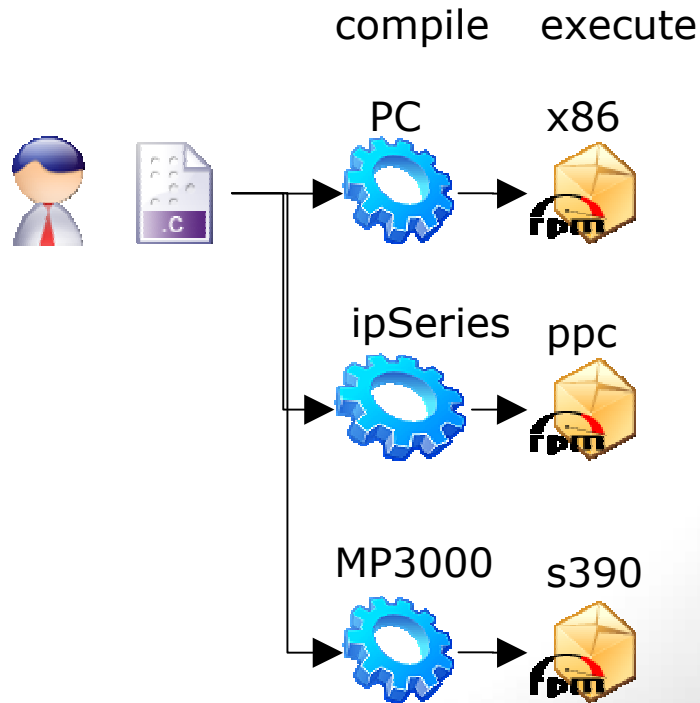
- glibc header files 32/64bit merge and cleanup
- application 32/64bit header cleanup
- kernel and user land 32/64bit system call interface cleanup
- separate executables from shared libraries (repackaging)
- creating generic /lib and /lib64 directories in file hierarchy for 32bit and 64bit shared libraries
- package and merge 32bit shared libraries into 64bit system

# ...Multi-Library System Building



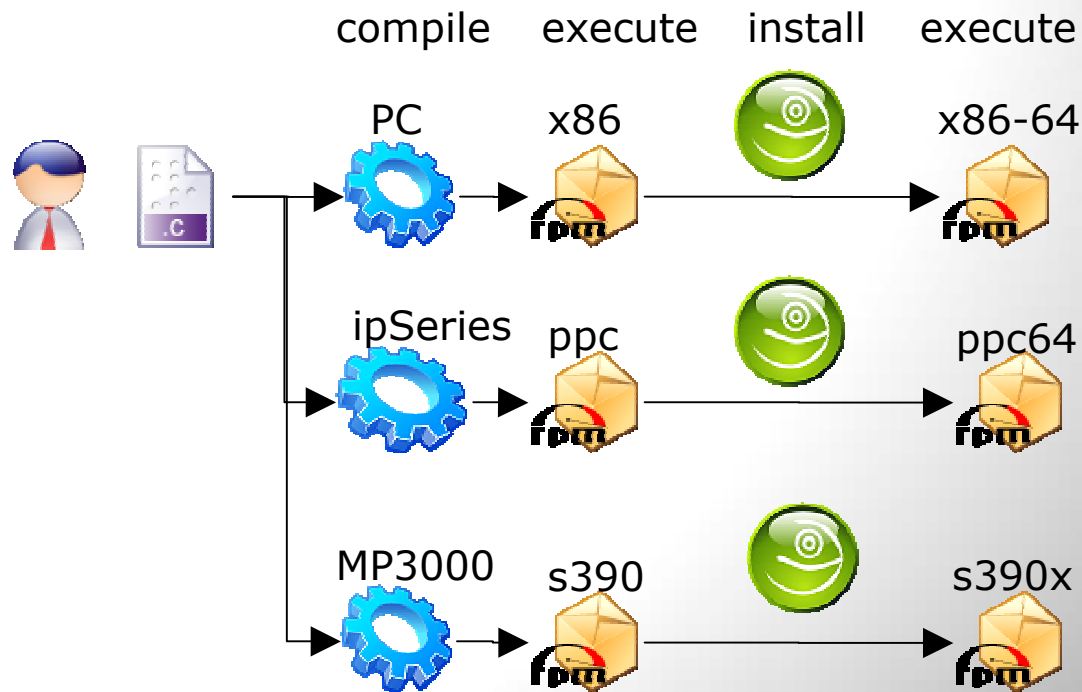
# Porting Applications Now Easy

- Development, compile, test and execute on local workstation: Recompile, test and execute on target architecture



# Deploying Applications Now Easy

- Multi-lib capable 64bit systems can execute 32bit executables: port once, run twice



## Current Multi-lib Archs

- x86 32bit -> 64bit x86-64 (AMD Hammer)
- ppc 32bit -> 64bit ppc64 (IBM ipSeries)
- s390 31/32bit -> 64bit s390x (IBM zSeries)
- (sparc 32bit -> sparc64) (experimental)
- (mips 32bit -> mips64) (experimental)
  
- Faster time to market for development
- Choice of hardware platform for user
- New potential markets for software companies
- *Note: axp (Alpha processor) and IPF (itanium Processor Family) are pure 64bit systems*

# SLES Deployment Matrix

	MP3000	G5	G6
SLES 7 S/390 & zSeries	31bit	31bit	31bit
SLES 7 zSeries	-	-	-
SLES 8 S/390 & zSeries	31bit	31bit	31bit
SLES 8 zSeries	-	-	-
	Z800	Z900	
SLES 7 S/390 & zSeries	31bit	31bit	
SLES 7 zSeries	31/64bit	31/64bit	
SLES 8 S/390 & zSeries	31bit	31bit	
SLES 8 zSeries	31/64bit	31/64bit	

# SLES 8 Common Features

- Additional YaST2 modules
  - Multipath Device Detection and Configuration
  - RAID configuration support
  - runlevel editor
- LVM – Logical Volume Manager
- Raw IO – more IO efficiency for databases
- Improved event logging
- Online SuSE manuals

# New Functionality

- text, graphical and browser based YaST2 installation (via samba, nfs, ftp)
- NGPT – Next Generation POSIX Threads Library
- Multipath I/O with LVM and MD (raid0,1,5 tools)
- Asynchronous I/O
- Journaling File systems (reiserfs, ext3, jfs)
- ACLs – Access Control Lists
  - more granular management
  - *Note: only few apps are enabled today*
- EVMS – Enterprise Volume Management System
  - alternative feature to LVM / MD tools



# Better Scalability

- Many harddisk (sd\_many) up to 2000 SCSI disks
- Multipath I/O – Striping, Redundancy and Load Balancing
- O(1) scheduler – efficient scheduling w/ high load
- Improved memory management
- Fast user space synchronisation (futex) for inter/intra process communication
- More scalable PID allocation (dynamic / faster allocation)

# Improved Interoperability

- Kerberos support (strong authentication)
- LDAP support
- ACLs for ext2/ext3/reiser/jfs all file systems (Access Control Lists)
- Samba 2.2.5 (File and Print) with ACLs
- CUPS printing system
- NFS v3, Netatalk
- VLAN support – more efficient routing

# SLES 8 S/390 & zSeries Features

- Improved support for 32bit databases in both 32bit and 64bit environment (mapped base patch: process defined mapping of shared memory segments location)
- Latest S/390 & zSeries specific device drivers (dasd, tape 3590, network, crypto)
- Hotplug support of dasd and tape devices
- Persistent device names as devfs replacement (recommended use with LVM; recycles devfs name space; *Note: object to future change*)
- Hardware crypto support integration into openssl engine

# SLES 8 S/390 & zSeries Features

- Fibre Channel SCSI
  - support of > 2000 devices enabled (zfcp + sd\_many)
  - automatic integration of into system on startup if added to /etc/zfcp.conf
- async IO
  - IO request execution while application continues to run, then signal on completion
  - higher throughput for databases
- source vipa
  - IP address take over on node failure

# SLES 8 S/390 & zSeries Features

- Non-interactive installation by extending parmfile capabilities with predefined network setup
- LABEL and UUID support to identify device (preferably use with LVM)
- Dump device configuration prepared in zipl.conf
- KDE 3.0.3 minimal system (w/ konqueror & mozilla)

# Pending Feature

- epoll – efficient polling on open connections
  - new API: `epoll_create` / `epoll_ctl` / `epoll_wait`
  - improves scalability on huge amount of connections

# Security

- PAM authentication modules
- Secure Shell: ssh
- Secure sockets: OpenSSL
- Encryption: GnuPG
- Full strong crypto enabled: apache via openssl-engine, ipsec, libcrypt, pkcs11 (w/ crypto hardware support)
- GPG signed rpm packages
- Basic Firewall
- VPN: FreeSwan
- Only minimal services running at boot as default

# Applications

- databases: mysql, postgres, ODBC / JDBC access
- webserver: apache, ext. modules, PHP + extensions, tomcat
- services: DNS, DHCP server & client, FTP, ...
- mail and news: SMTP, POP, IMAP
- proxy: squid
- ...
- SAP certification done for SLES 8 zSeries



# Development

- gcc 3.2 (C and C++ compiler)
- perl, python, ruby, tcl/tk, openmotif
- diff, patch, make, flex, bison, autoconf, automake, binutils, libtool, gdb, strace, ltrace
- repacking of development libraries

# Summary

- SLES 8 is an advanced application porting and execution platform
- SLES 8 has advanced enterprise class kernel features available today

# Contact Information

- UnitedLinux website  
<http://www.unitedlinux.com>
- SuSE Linux Enterprise Server  
<http://www.suse.com/SLES>
- ISV Program Contact: [isv@suse.de](mailto:isv@suse.de)
- US sales contact: [jws@suse.com](mailto:jws@suse.com)
- EMEA sales contact: [s390-sales@suse.com](mailto:s390-sales@suse.com)

# Questions?

