What's New: SUSE Linux Enterprise Server 11 for System z

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Agenda

- Novell/IBM Relationship overview
- What we introduced in SLES10 SP2 (context)
- SLES11 – a feature deep-dive
- Where to go from here

Novell® and IBM Partnership Highlights

- Novell is a Strategic IBM Alliance Partner since December 2005

- SUSE® Linux Enterprise runs on all IBM hardware platforms

- IBM/Novell co-developed IBM Retail Environment on SUSE Linux Enterprise (IRES)

- SUSE Linux Enterprise is the only Linux platform supported for IBM SAP Business Intelligence Accelerator

- IBM support-line availability on SUSE Linux Enterprise

- SUSE Linux Enterprise Server is on IBM's Passport Advantage (PPA) Program

- Novell ships Websphere Community Edition with SUSE Linux Enterprise Server

- Novell is accredited for the IBM Information on Demand Specialty and Ready for Energy and Environment Programs

- Novell and IBM developed a one-click installation for Open Collaboration Client Solution powered by SUSE Linux Enterprise from Novell
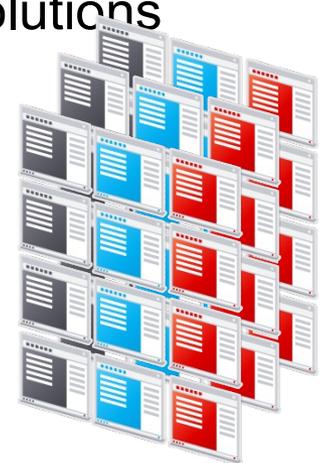
SUSE® Linux Enterprise Server for System z
Built for Demanding Conditions

- SUSE Linux Enterprise Server for System z includes over 180 features requested by IBM

- SUSE Linux Enterprise Server is recognized as a leading platform for mission-critical computing:
  - Higher reliability than Windows, Red Hat and Solaris; according to Yankee Group
  - #1 in the SAP-on-Linux market (75% share)
  - #1 in the mainframe Linux market (80% share)
    - #1 in High Performance Computing (6 of the top 10)

- Provides same capacity as tens or hundreds of x86 servers

- Provides mainframe resiliency and other mainframe benefits

A Building Linux Ecosystem

- Applications range from data intensive, high I/O to CPU intensive applications, including:
  - Oracle, SAP, IBM middleware

- More than 1,000 certified applications available
  - Over 400 ISVs
  - Over 280 IBM software applications
  - Includes many open source software applications, including: Apache, MySQL, SAMBA
  - Opportunity to deliver more complete, competitive solutions

- System z10 broadens application set to include **more** CPU intensive workloads

- http://www.ibm.com/systems/z/solutions/isv/linuxproduct.html

- http://www.novell.com/partner/isv/isvcatalog

SUSE Linux Enterprise Server for System z

The optimized version of SUSE Linux Enterprise Server designed to run on IBM System z mainframes

Advantages:

Fully supported by IBM, with #1 share for Linux on System z

Ideal for workload consolidation, providing major cost savings

Starter System available for testing and proofs of concept

Over 1,000 certified applications available

New features:

Cross-architecture debugging

Dynamic add/remove of CPU and memory

Vertical CPU management for System z10

Higher performance analysis in the disk subsystem

SLES 10 SP2 for System z -
Setting the context

Enhancements introduced in SUSE Linux Enterprise Server 10 SP2

- Install/firstboot support for kdump configuration
- Kernel Named Save Segment (NSS) support
- Provide Linux process data into z/VM monitor stream
- System z support for processor degradation
- In-Kernel crypto exploitation of new CP Assist functions (AES 192 / 256 and SHA 384 / 512)
- Large page support
- CPU Node Affinity
- HiperSockets Layer2 and IPv6 support
- STSI change for capacity provisioning

Enhancements introduced in SUSE Linux Enterprise Server 10 SP2 (2)

- skb scatter-gather support for large incoming messages
- FCP performance data collection - adapter statistics
- Dynamic CHPID reconfiguration via SCLP
- z/VM unit-record device driver and user tool
- OSA 2 Ports per CHPID support
- User space tooling for auto-adaptive CPU and memory mgmt
- Dynamic CPU hotplug daemon for System z
- Software Support for CP Assist Instructions AES & SHA

SUSE Linux Enterprise 11

- SUSE Linux Enterprise Server 11 was launched on March 24, 2009.

- As is typical, major changes have been made across version boundary.

- Also as typical, close cooperation with IBM resulted in numerous specific enhancements for IBM hardware and software.

    - Approximately 180 features were requested by IBM specific to System z

SUSE Linux Enterprise Server System Requirements

- SUSE Linux Enterprise Server 9 SP4:
    - IBM S/390, zSeries z800, z890, z900, z990, or IBM System z9, z10 servers

- SUSE Linux Enterprise Server 10 for System z:
    - IBM zSeries z800, z890, z900, z990, or IBM System z9, z10 servers

- SUSE Linux Enterprise Server 11 for System z:
    - IBM System z9 or System z10 servers

- One or more network connections

- 512MB RAM for initial installation; more or less may be required subsequently, depending on workload needs.

SUSE Linux Enterprise Server System Requirements (2)

- The equivalent of one or more IFLs or full-speed standard CPs for acceptable performance

  - Some workloads perform better with 2 processors, regardless of total capacity available

- Approximately 3GB of disk storage for a default initial Linux guest system; more or less disk storage may be required depending on your workload requirements.

SLES 11 for System z - Feature Overview

SUSE® Linux Enterprise Server 11 for System z Features

- **Cross architecture debugging:** System z core dumps can be analyzed in x86 systems, negating the need for a duplicate System z server

- **Dynamic add/remove of CPU and memory:** resources of a Linux guest under z/VM can be adjusted while running. A pool of CPUs are dynamically given to a Linux guest and used as needed

- **Higher performance analysis in the disk subsystem:** gives performance analysts the same type of view into SCSI over Fibre Channel Protocol that they have with mainframe Direct Access Storage Devices (DASD)

SUSE® Linux Enterprise Server 11 for System z Features

- **Vertical CPU management:** helps get the most performance out of System z10 servers by being aware of the server's NUMA characteristics

- **Linux CPU Node Affinity:** improves performance by scheduling processes to the optimal node where the CPU is associated, exploiting the new System z10 CPU node topology

- **Large page support**: enables better performance with large memory footprints like in Java or database workloads by exploiting new System z10 large memory pages (1MB)

- **Enhanced HiperSocket support**: Additional Layer 2 suport for IPV4 and support for IPV6

SLES 11 Feature Details

Software packaging

- Reduction in inter-package dependencies
    - A more "minimal" installation pattern than before
    - A Minimal System pattern (JeOS), intended for appliances
        - *Extremely* minimal. It boots, and that's about all
- The kernel has been split into multiple RPMs
    - Kernel-default-base
        - The actual kernel and a very small number of modules for things like SCSI, EXT3
    - Kernel-default
        - All the other kernel modules and particularly the hardware-dependent ones
- High Availability and Mono have been split out into separate "extensions."

Software Packaging (2)

- The Software Development Kit is no longer a "dumping ground" for software that wasn't supported by Level 3/Engineering, or wasn't supported at all.

  - A new "Extras" software channel has been added that contains useful software, but is not supported by Novell.

- Multiple concurrently installed versions of a package

  - Primarily intended for kernels (yay!), but there may be more uses

- The command line software update tool (zypper) can operate on RPMs from a repository, an arbitrary URI, or a file on the local system, all with dependency resolution.

Software Adds/Removals

- Added:
    - Heartbeat2 has been replaced by openAIS and Pacemaker
    - java-1_4_2-ibm-1.4.2_sr12
    - java-1_6_0-ibm-1.6.0
    - ruby-1.8.7 (*not* Ruby on Rails)
    - FUSE (File system in USEr space)
    - "Command not found" handling in the shell

Software Adds/Removals

- Removed
    - java-1_5_0-ibm-1.5.0
    - Previously deprecated
        - > CPINT (in favor of VMCP from s390-tools)
        - > JFS (IBM's Journaling File System)
        - > EVMS
        - > rug / zmd
        - > uw-imapd

Architecture

- Reduced duplication of code/function in YaST (including the installer)

- More consistent user interface in YaST

- Completely new "Partitioner" interface

- New command line "update stack" - zypper

    - Much faster than rug and zmd

- A new Architecture Level Set (ALS) beginning with SP1 or SP2

    - Only **z9** and **z10** hardware will be usable

    - Prior to this change, any zSeries or System z processor will be sufficient

Network Configuration

- Allow different host names for different IPs on different NICs

- Support qeth devices for bonding in YaST

- Network hardware configuration information no longer resides in /etc/sysconfig/hardware
  - Everything done in /etc/udev/rules.d/ now

File Systems

- EXT3 is now the default file system
  - Reiserfs and XFS are still included and supported
- Posix compliant OCFS2 - aka: General Purpose OCFS2
- OCFS2 enablement in openAIS / Pacemaker
- C-LVM2 enablement in openAIS / Pacemaker
  - Clustered LVM2, replaces EVMS
- Dynamic resizing of a Fibre Channel LUN
- Online resizing of a multipathed device
- Technology previews of EXT4, eCryptfs, and read-only root file systems

Hardware Support

- Sysplex Timer Protocol support (STP/ETR)
- GCC exploitation of latest hardware instructions
- GCC "tuning" for System z hardware
- binutils exploitation of latest hardware instructions
- Decimal floating point support in GCC backend
- binutils Decimal Floating Point support
- Long random numbers generation via exploitation of the latest cryptographic cards

Hardware Support (2)

- Selective logging of ECKD DASD devices
- High Performance FICON Infrastructure
- Hyper PAV support
- Vertical CPU management

Fibre Channel Protocol

- Performance Data collection and analysis
    - Kernel exploitation of hardware feature
    - User space tools
    - Intended to provide more visibility of the various FCP and SCSI components that affect performance

- Message cleanup
    - Help to reduce service costs

- Automatic Port Discovery

- LUN discovery user space tool

- Enhanced trace facility

z/VM Interoperability

- Exploitation of DCSSs above 2GB line
- Linux struct page elimination
  - Allows DCSS to become freely allocatable anywhere in the kernel address space without massive control block overhead
- Improved handling of dynamic subchannel mapping
- Extra kernel parameters via VMPARM
  - ipl ### (parm init=/bin/bash

Installer

- Support for 2 OSA Ports per CHPID
- Support root on encrypted file system
- The default /etc/fstab entries have been changed to by-path for System z
  - /dev/disk/by-path instead of /dev/disk/by-id
  - The /dev/disk/ entries provide persistent device names
- Support for installation on multipathed device
- CMS script for initial IPL under z/VM

Performance Management

- Integrate Performance Management MIBs used by Velocity Software into net-snmp

- Control groups
    - Replacement for CKRM (Class-based Kernel Resource Management)

- CPU sets
    - Full CPU administration capabilities for Linux kernel
    - Based on Control Groups

- See prior slides for the FCP-related changes

Security

- 'Security health status' YaST Module
    - 'Bastille' like functionality
        - Under YaST -> Security and Users -> Local Security

- Basic SELinux enablement
    - Includes
        - Kernel built to support SELinux
        - Patches to all common user space packages
        - Necessary libraries shipped
    - Does *not* include:
        - SELinux specific software packages (e.g. checkpolicy, policycoreutils, selinux-doc)
        - SELinux policies
    - QA will be run with SELinux *disabled*

System Management/Configuration

- Kernel message numbers
  - Prefixes a message number to kernel messages issued by the s390 architecture and drivers
  - No, it's not the same as the Messages and Codes manuals
- Support for dynamic memory attach/detach
- Standby memory add via SCLP (LPAR mode)
- Standby CPU activation/deactivation (LPAR mode)
- dm-multipath support for xDR/GDPS
- Block layer I/O cancel (abort) capability
  - Potentially used for xDR

System Management/Configuration (2)

- Call Home data support
- Dynamic add of cryptographic card
- Re-IPL from different device
- SCSI Standalone dumper
- Crash: Support for S390 stand alone dump
- Crash: Support for Cross-Architecture Debugging
- utmp format that is compatible between 32 and 64 bit
- Kernel Virtual Machine (KVM) Technology Preview

SUSE Linux Enterprise Mono Extension

- A .NET application framework that allows you to run .NET-based applications on SUSE Linux Enterprise Server

  - Run .NET applications on Linux (including ASP.NET)

  - Mainframe support for .NET applications

  - Performance and scalability advantages over Windows

  - Target Linux from Visual Studio

- Develop anywhere – Deploy anywhere

  - Includes a toolchain for Linux

  - Runtime is binary-compatible with .NET on Windows

- A complete and modern development platform for Linux

SUSE Linux Enterprise Mono Extension (2)

- The necessary software to develop and run .NET client and server applications **across platforms** on Linux, Solaris, Mac OS X, Windows, and Unix

- A thriving open source project with a growing community

- What Can You Do with Mono?

  - Migrate Microsoft .NET desktop and server applications to Linux without significant investment in rewriting code

  - Target multiple platforma and increase addressable market

  - Leverage existing expertise in computer languages for more efficient development

Miscellaneous

- kexec for system reboots
    - Loads new kernel and branches to it from a running kernel
    - Faster reboots for all architectures
- traceroute over TCP as well as UDP

More Features ...

SUSE Linux Enterprise Server for System z includes over 180 features requested by IBM

- 302783 AF_IUCV Protocol support

- 302785 Kernel Named Save Segment (NSS) support - kernel part

- 302787 Provide Linux process data into z/VM monitor stream

- 302788 System z support for processor degradation

- 302789 In-Kernel crypto exploitation of new CP Assist functions (AES 192 / 256 and SHA 384 / 512)

- 302790 System z: large page support

- 302791 Linux CPU Node Affinity

- 302792 HiperSockets MAC layer routing support

- 302793 skb scatter-gather support for large incoming messages - QETH Exploitation

- 302795 STSI change for capacity provisioning

And More Features ...

- 302796 FCP - Performance data collection - adapter statistics
- 302797 Dynamic CHPID reconfiguration via SCLP
- 302798 z/VM unit-record device driver
- 302800 z/VM unit-record device driver - tools
- 302801 Dynamic CHPID reconfiguration via SCLP - tools
- 302802 OSA 2 Ports per CHPID support
- 302805 User space tooling for auto-adaptive CPU and memory mgmt
- 302806 Dynamic CPU hotplug daemon for System z
- 303556 Integrate Performance Management MIBs used by Velocity Software into SNMP
- 303557 Change the default fstab entries to by-path for System z
- 303627 Have an "escape to shell" option during installation
- 304019 Enable modular drivers for non-I/O subchannels
- 304023 FCP - Enhanced Trace Facility
- 304028 Provide CMS script for initial IPL under z/VM
- 304030 FCP - Performance Data colletion & analysis (userspace)

- 304031 Exploitation of DCSSs above 2G
- 304032 FCP - Performance Data colletion & analysis (kernel)
- 304033 Linux struct page elimination
- 304039 FCP - code cleanup stage 1
- 304040 FCP - message cleanup
- 304042 dm-mp support for xDR/GDPS
- 304048 Merge CTCMPC into CTC device driver for upstream integration
- 304050 FCP - Automatic Port Discovery
- 304051 Linux Support for Dynamic Memory Detach
- 304052 Linux to add Call Home data
- 304054 Dynamic Add - Device Driver Exploitation
- 304055 Long Random Numbers Generation
- 304056 System z ZFCP Performance Statistics
- 304057 Selective Logging of ECKD DASD devices
- 304058 ZFCP Performance Statistics - blktrace
- 304060 Standby memory add via SCLP
- ...

Additional info

Selected software versions at GA

- apache2-2.2.10
- binutils-2.19-11.28.s390x.rpm
- cups-1.3.9-8.14.s390x.rpm
- e2fsprogs-1.41.1-13.9.s390x.rpm
- freeradius-server-2.1.1-7.6.s390x.rpm
- fuse-2.7.2-61.14.s390x.rpm
- gcc-4.3-62.198.s390x.rpm
- glibc-2.9-13.2.s390x.rpm
- gnome-applets-2.24.1-3.27.s390x.rpm
- kde4-4.1.3-3.31.s390x.rpm
- kernel-default-2.6.27.19-5.1.s390x.rpm
- krb5-1.6.3-133.10.s390x.rpm
- mono-core-2.0.1-1.17.s390x.rpm
- mysql-5.0.67-13.15.s390x.rpm
- mysql-client-5.0.67-13.15.s390x.rpm
- mysql-Max-5.0.67-13.15.s390x.rpm
- net-snmp-5.4.2.1-8.1.s390x.rpm

- snmp-mibs-5.4.2.1-8.1.s390x.rpm
- openldap2-2.4.12-7.13.s390x.rpm
- openssh-5.1p1-41.24.s390x.rpm
- openssl-0.9.8h-30.11.s390x.rpm
- openssl-ibmca-1.0.0-104.10.s390x.rpm
- oracleasm-2.0.5-7.6.s390x.rpm
- orarun-1.9-172.19.s390x.rpm
- perl-5.10.0-64.42.s390x.rpm
- php5-5.2.6-50.17.s390x.rpm
- postfix-2.5.6-1.14.s390x.rpm
- postgresql-8.3.5-2.15.s390x.rpm
- python-2.6.0-8.7.s390x.rpm
- rpm-4.4.2.3-37.8.s390x.rpm
- ruby-1.8.7.p72-5.21.s390x.rpm
- s390-tools-1.8.0-43.2.s390x.rpm
- samba-3.2.7-11.6.s390x.rpm
- xorg-x11-7.4-9.15.s390x.rpm

Standards Support

- Compatibility and Interoperability
    - Linux Standards Base 3.2
    - ODF Alliance (OpenDocument Format)
    - WS-I (Web Service Interoperability Organization)
    - Organization for the Advancement of Structured Information Standards (OASIS)

- Management
    - Distributed Management Task Force

- Accessibility and Internationalization
    - Section 508
    - I18N

How to Find Certified Applications

- Visit our catalog:
  http://www.novell.com/partner/isv/isvcatalog

SUSE Linux Enterprise High Availability Extension

- An affordable, integrated suite of robust, open source clustering technologies

- Advantages
    - Maintain business continuity
    - Protect data integrity
    - Reduce unplanned downtime for mission critical workloads

- Key Features
    - Flexible, policy driven clustering solution
    - Cluster-aware file system and volume manager
    - Continuous data replication
    - User-friendly tools, and resource agents out of the box

Ten Application Categories for System z Servers

In decreasing order of desirability:

- Data intensive - Large working set and/or high I/O content applications

- I/O bound - High I/O content applications

- Mixed low - Multiple, data intensive applications or skewed OLTP, MQ applications

- Mixed high - Multiple, CPU-intensive simple applications

- Database - Oracle DBMS or dynamic HTTP server

Ten Application Categories for System z Servers (2)

- Java light - Data-intensive Java applications

- Java heavy - CPU-intensive Java applications

- Skewless OLTP - Simple and predictable transaction processing

- Protocol serving - Static HTTP, firewall, etc.

- CPU intensive - High use of the CPU to do numerical calculations

Common Linux for System z Workloads

- Most popular proprietary applications: IBM WebSphere family, Oracle Database, SAP, and applications from BEA and CA

- Most popular open source applications—Apache Web Server, MySQL and PostgreSQL, OpenLDAP Directory Server and Samba

- Business applications with large amounts of I/O are "good fit" applications; whereas, applications with large amounts of computation have not been considered good fits.

- New IBM System z10 server with 4.4GHz quad-core processors broadens list of good fit applications to include CPU intensive applications.

- White paper titled *Workloads for SUSE Linux Enterprise Server for System z* describes characteristics of workloads for System z servers.

Integrated Systems Management
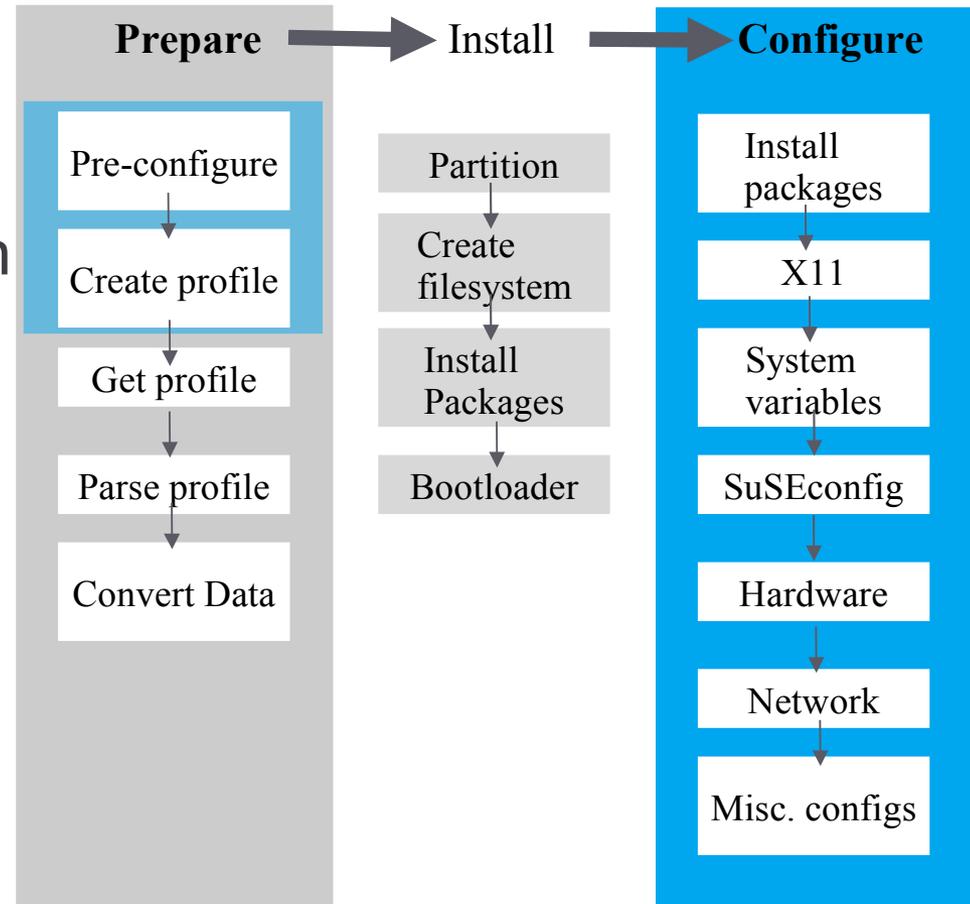# Package Management Subsystem

- ZYpp: Core of the new software management stack

- ZYpper: Command line package manager
  - Manipulates package repositories (like the Build Service)
  - Search for, install, remove, or update packages and more

- libzypp: Software management library that provides all the functionality for a package manager
  - APIs for
    - > Package repository management
    - > Solving packages, products, patterns and patches (installation, removal, update and distribution upgrade operations) dependencies
    - > Committing the transaction to the system over a rpm target
    - > Browsing available and installed software
  - A suite of maintained solving test cases

Integrated Systems Management YaST

- Unified and consistent single interface to all systems management tasks via modules
    - Desktop environment independent
    - Two graphical and two text mode interfaces
    - Development platform for 3rd party modules
- Configure every aspect of the server
    - Installation / configuration
        - partitioning and file systems, LVM, boot loader, timezone
    - Software management: update, software selection, product creation, installation server
    - User management (local, NIS, LDAP, Kerberos), sudo
    - Hardware: DASD, FCP, OSA, DUMP device

Integrated Systems Management AutoYast

- A tool for installing SUSE Linux Enterprise on systems with as much (or little) automation as you want

- Works in networked and non-networked environments

- Very flexible

- Very scalable

- Easy to use

Prepare → Install → **Configure**

| Prepare	Install	Configure
Pre-configure	Partition	Install packages
Create profile	Create filesystem	X11
Get profile	Install Packages	System variables
Parse profile	Bootloader	SuSEconfig
Convert Data		Hardware
		Network
		Misc. configs

Integrated Systems Management Common Information Model (CIM)

- Support for open Common Information Model management industry standards, basis for development of standards-based cross-platform management tools

- Key Components:
    - Small Footprint CIM Broker (SFCB)
    - Storage Management Provider (SMI-S providers for Volume Management & Snapshot, libstorage)
    - Virtualization Management Provider (libvirt)
    - Power Management Provider
    - Software Management Provider PackageKit Technology preview

Integrated Systems Management Supportability Infrastructure

- Novell Support Link
  - Built-in into SLE, easily file a support incident with Novell Technical Services
  - YaST module enables quick reporting of an incident
  - Review any and all data before submitting, and discard any bit considered sensitive
  - Enables diagnostics performed by the Novell Support Advisor

- Enablement for Novell Support Advisor
  - System Discovery based upon IP address or range, or DNS name
  - SUSE Linux Enterprise Server Health Diagnosis, with recommended solutions
  - Authentication support for Novell Customer Center
  - Automated Support Diagnostic Pattern deployment
  - Centralized Novell Technical Services Link

Novell Support Advisor
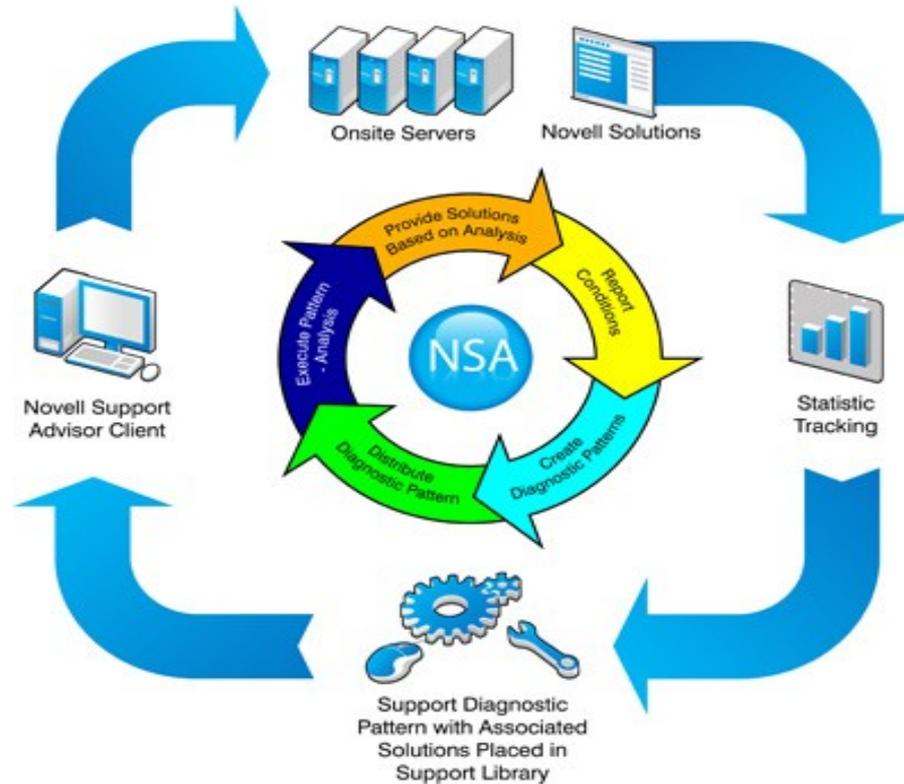
Integrated Systems Management Novell Customer Center (NCC)

- The Novell Customer Center remains at the heart of Novell's relationship with the customers to manage SUSE Linux Enterprise subscriptions
  - Review, download of released updates
  - Subscription, renewal of entitlements
  - Access to knowledge base
  - Monitoring of your deployments
  - Repositories for maintenance and install use
- Additionally, in cooperation with the SMT ability to automatically assign registration codes

Integrated Systems Management Subscription Management Tool (SMT)

- The Subscription Management Tool (SMT) is a local package proxy tightly integrated with Novell's support infrastructure
  - Saves bandwidth
  - Preserves firewall perimeter
  - Helps automatically assign registration codes to devices
  - Preserves Novell Customer Center functionality
  - Enables high-security disconnected operations
  - Facilitates tracking your deployments or migrations
- Included at no cost in SLES entitlement
- SMT supports SLE 11 as a client at SLE 11 GA