Adaptive Computing Controller in SAP NetWeaver 7.1
Features and Functions

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Product Manager
Virtualization & Adaptive Computing
1. General Overview
2. The Concept
3. Partner Involvement
4. Technical Overview
5. ACC Installation and Landscape Preparation
6. AC Landscape Configuration
7. How to start with Adaptive
8. AC Benefits and Outlook
Today’s Pain Points

- Insufficient server utilization
- Complex IT landscapes
- Low flexibility to assign and utilize hardware resources
- High effort to setup and integrate new components into existing infrastructure
Increase Flexibility With Adaptive Computing

ADAPTIVE COMPUTING
- is an approach to design hardware, software and system services
- pools computing resources for better performance at lower costs

ANY SERVICE, ANY TIME ON ANY SERVER

Appl. Platform
Objects, Engines, and Components

SAP NetWeaver
Composition Platform

Enterprise Services Repository
Partner Components

Adaptive Computing Virtualization

IT Infrastructure
- Computing
- Network
- Storage
- Control (ACC)
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Increased Flexibility with Hardware Pooling
IT Infrastructure – Building Blocks

**COMPUTING**
- Compute nodes are physical or any virtual server
- Add and remove computing resources with low admin efforts

**NETWORK**
- Connects computing nodes to each other
- Builds up connection between building blocks ‘Computing’ and ‘Storage’
- Transport layer for virtualization

**CONTROL**
- Adaptive Computing Controller in SAP NetWeaver
- Single point of control to operate, observe and manage
- Capability of SAP NetWeaver
- Based on Standards
- Interface to third party software

**STORAGE**
- Application data stored on centralized storage system(s) within a network
- Any topology (IP, FC…) supported
- No local disk space required to run SAP applications
Example of an Adaptive Computing Landscape

Centralized Storage System

Control Node

Computing Nodes

Server Network Switch

Storage Network Switch

Adaptive Computing Controller

Centralized Storage System
How Does Adaptive Computing Work in Detail?

Adaptive Computing Controller

Computing Resources

Central Storage

ABAP System (SID S01)

Dialog Instance

Network Card bound to V1

File System attached to M1

Mount Point M1

Virtual Host Name V1

Start

Database

Software installed on Central Storage

Server

Server C1

Server

Server
How Does Adaptive Computing Work in Detail?

Adaptive Computing Controller

- Computing Resources
- Software installed on Central Storage

Relocate
1) Stop Central Instance on C1
2) Unmount / unbind on C1
3) Mount / bind on C2
4) Start Central Instance on C2

Central Instance

Central Storage

Database
Central Instance
Dialog Instance

ABAP System (SID S01)

J2EE (SID S0n)
Features

**Standard Features**
- SAP system management
- Resource management
- Control (start / stop / relocate SAP systems)
- Observing (give you an overview of your physical and logical landscape)
- Archiving (archiving of the controller log data)

**Enhanced Features**
- Task planner
- Mass operation
- Support of multiple services on one server
- User exits
- Interfaces to use ACC functions with other management tools (WebServices)
ACC Use Cases

- **Easy management of SAP system growth:**
  - Start with small server and relocate with growing requirement to server which fit best.

- **System parking lot:**
  - Stop idle SAP systems and “wake up” if needed.

- **Easy and fast hardware replacement:**
  - Easy and fast replacement of servers in the AC landscape.

- **Mass Operation for HW maintenance weekend:**
  - Shutdown and startup of all systems with one click in the ACC.

- **Maintenance Window for Upgrade/Conversion to short:**
  - Use the most powerful server for upgrade or conversion procedures.

- **Task Planner:**
  - Schedule planned SAP system start/stop, move systems.

- **Balance Performance Peaks:**
  - Provide for dedicated systems the required performance.
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Adaptive Computing and Partner Solutions

SAP Adaptive Computing Controller

System Landscape Directory

Application (SAP)

Adaptive Computing Virtualization Layer (Interfaces, Agents, Libraries etc.)

Partner Solutions
Provisioning, Orchestration, System Management, Virtualization

Computing Infrastructure (Partner)

Computing
Storage
Network
### Passed Compliance Tests (Extract)

<table>
<thead>
<tr>
<th>Certificate No.</th>
<th>Date of issue</th>
<th>Technology Partner</th>
<th>Computing</th>
<th>Storage</th>
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<td>Adaptive Computing Controller 1.0</td>
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</table>

Agenda

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2. The Concept
3. Partner Involvement
4. Technical Overview
5. ACC Installation and Landscape Preparation
6. AC Landscape Configuration
7. How to start with Adaptive
8. AC Benefits and Outlook
AC Landscape Architecture for UNIX/Linux OS

Application Services

AS

CI

DB

Filesystem

/sapmnt/SID
/usr/sap/SID/DV.01
/sapdb/..

Filesystem

/sapmnt/SID
/usr/sap/SID/DV.00
/sapdb/..

Filesystem

/sapdb/.. /var/spool/sql/

DB datafiles

Distributed Filesystem

FS Export

SAP / DB binaries

Storage System

e.g. SAN

volume mapping
Because Windows does not offer a network file system which is supported by SAP, FC or iSCSI LUN’s for the components of the SAP instances are used.

The database can be preinstalled in the OS of the servers in the AC landscape and the datafiles are relocated.
Virtualization Concept With AC

Goal of Virtualization
- Run SAP instances on a pool of servers (switchover) without a change of the configuration.

What is Virtualization
- Specific way of installing SAP instances to be able to switchover across different hosts.
- Virtualization is a additional layer between the IT infrastructure and the SAP instance.
- Well known in the HA cluster technology.

Used Technology
- Relocatable (virtual) IP-addresses and hostnames.
- SAP instances are installed on virtual hostnames instead of the physical hostname.
- Pool all SAP instance components (incl. binaries) on a central storage system.
Virtualization Concept With AC

R/3 ABAP system
SAP instance
SID: WRR
installed on hostname ciwrr

virtual hostname: ciwrr
IP-Address: 10.17.80.36

physical hostname: ld0539
IP-Address: 10.17.80.14

R/3 ABAP system
SAP instance
SID: WRR
installed on hostname ciwrr

virtual hostname: ciwrr
IP-Address: 10.17.80.36

physical hostname: ld0540
IP-Address: 10.17.80.15
Virtualization Concept With AC – OS

Network interfaces
- physical IP
- virtual IP

```
# ifconfig

eth0  Link encap:Ethernet  HWaddr 08:11:04:9B:E1:3D
     inet addr:10.17.80.36  Bcast:10.17.80.127  Mask:255.255.255.128
     UP BROADCAST NOTRAILERS RUNNING MTU:1500 Metric:1
     RX packets:1476382969  errors:0  dropped:0  overruns:0  frame:0
     TX packets:1432609425  errors:0  dropped:0  overruns:0  carrier:0
     collisions:0  txqueuelen:100
     RX bytes:1316958199 (1255.9 Mb)  TX bytes:1419383592 (1353.6 Mb)
     Interrupt:29  Memory:f05f0000-f0600000

eth0:ciwa  Link encap:Ethernet  HWaddr 08:11:04:9B:E1:3D
    inet addr:10.17.80.36  Bcast:10.17.80.127  Mask:255.255.255.128
    UP BROADCAST NOTRAILERS RUNNING MTU:1500 Metric:1
    Interrupt:29  Memory:f05f0000-f0600000

eth0:dbwa  Link encap:Ethernet  HWaddr 08:11:04:9B:E1:3D
    inet addr:10.17.80.36  Bcast:10.17.80.127  Mask:255.255.255.128
    UP BROADCAST NOTRAILERS RUNNING MTU:1500 Metric:1
    Interrupt:29  Memory:f05f0000-f0600000
```
New Installation of Managed SAP Systems

Installation Preparations

- Prepare file systems on central storage system and mount to the server.
- Prepare/configure users, groups, hostnames and services (avoid conflicts with settings in central services like LDAP, DNS, NIS, …)

Installation with SAPINST with NW04 SR1 and higher

- No switch to the virtual hostname on OS level before SAPINST necessary!!
- SCS installation

  sapinst SAPINST_USE_HOSTNAME=scs<sid>

- Database installation

  sapinst SAPINST_USE_HOSTNAME=db<sid><##>

- Central Instance Installation

  sapinst SAPINST_USE_HOSTNAME=ci<sid><##>
Virtualization of an SAP system which is already installed on physical hostnames

- The supported method is the homogeneous system copy.

Homogeneous System Copy to change the hostname

- When a homogeneous system copy is performed, the target SAP system is installed on the same operating system and the same database system as the source SAP system.
- The hostname of the target system is installed on the new virtual hostname.
- The contents of the database are copied from the source to the target system.

Pragmatic Approach

- Take the hostname of the physical server as the new virtual hostname of the SAP instance and rename the server.
Change SAP System to Virtual Hostnames - Info

SAP System Copy
- http://service.sap.com/systemcopy

SAP Systems in Switchover Environments
- http://service.sap.com/ha

Network Setup
- http://service.sap.com/network
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**ACC 7.1 Components**

**SAP NetWeaver 7.1**
- J2EE only
- SLD
- ACC is already part of the NetWeaver standard installation

**SAP Gateway**
- Standalone Gateway is recommended (for registering ABAP instances at the SLD)

**Managed Landscape**
- 4.6C (4.6D Kernel) or higher
- SAP WebAS ABAP: choose a patch level where transaction RZ70 is available
Migrate from ACC 1.0 to ACC 7.1

Migration Procedure

- ACC 1.0 in productive use
- Install NW 7.1 and configure SLD and ACC
- Export SLD Content from ACC 1.0
- Import SLD Content to ACC 7.1
- Provide managed SAP systems with hostagents
- Activate imported configuration of managed SAP Systems in ACC 7.1 (any granularity possible)
SLD usage of ACC

- Unique data source for Adaptive Computing Controller landscape data.
- One central SLD per Adaptive Computing landscape.
- Available after the installation of the WebAS Java.
Data Supplier and Clients

- ABAP Data Supplier
- J2EE Data Supplier
- Other Data Supplier
- SLDREG (lib/exe)
  - XML
  - File IO
- SAP J2EE Engine
  - JCo RFC Provider
  - SLD Bridge
    - Generic Servlet
    - Specific Servlet
- PRD SLD
- HTTP
- RFC
- Java
- HTTP
- SLD Bridge
- DEV SLD
- ABAP Client
- Java Client
- RFC
- WBEM (HTTP)
Registering Systems

- All SAP systems of an adaptive landscape need to be registered in a central SLD.

ABAP / Java

- Register ABAP systems ➔ transaction RZ70.
- Register J2EE systems ➔ Visual Admin (SLD Data Supplier).

Prerequisites

- ABAP systems must be patched to a level where the RZ70 is available.
- Registered systems including all Application Servers must be up and running.
- Registered systems must run on virtual hostnames.
Install hostagent
- Download and extract saphostagent.sar
- create user sapadm
- call saphostexec –install
- Location: /usr/sap/hostctrl
Hostagent Components

- **saphostexec**, a UNIX daemon/NT service that implements:
  - Execution of operating system commands
  - Collection of operating system statistics
  - User authentication
  - Bootstrapping of saphostctrl

- **saphostctrl**, a UNIX daemon/NT service that implements
  - Web service runtime and interfaces
  - sapstartsrv in hostmode

- saphostexec must run in the context of a privileged OS user

- saphostexec and saphostctrl communicate with each other through UNIX domain sockets/named pipes
Register Servers in SLD with the Hostagent

Create SLD connection file
- cd /usr/sap/hostctrl/exe
- ./sldreg -configure slldest.cfg

Restart hostagent
- ./saphostexec -restart
sapacosprep libraries

Structure of sapacosprep

- Platform library: managing virtual hostnames and network filesystems
- Storage Library: managing specific storage solutions

```
sapacosprep
  executable

libsapacosprep.so
  platform library
  managing virtual IP addresses and network filesystems

libsapacosprep_<pid>.so
  storage library
  managing specific storage solutions
```
ACC Partner Libraries for ACC 7.1

- The already available partner API will also work for ACC 7.1.
- The sapacosprep executable will still exist and can be used for library testing.

Library Location for 7.1 (incl. platform lib for Linux & Windows)

- http://service.sap.com/swdc

Partner specific platform & storage lib’s

- https://www.sdn.sap.com/irj/sdn/adaptive
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Wizard based Configuration Steps

**SAP NetWeaver 7.1 initial setup**
- User passwords
- NWA settings
- SLD local or remote

**Configure NWA**
- User passwords
- NWA managed landscape
- SLD settings
- ACC enable

**Configure Adaptive Computing Controller 7.1**
- Configuration template
- Basic configuration
- ACC operational settings
Configure Adaptive Computing Controller 7.1

**Detailed ACC configuration**

- Basic settings and password for communication with the host agents.
- Multiple Services ➔ License Key required (free of charge).
- User Exit enabled / disabled.
- Timer settings for ACC
ACC User Management

**Concept**

- ACC User Administration is part of the J2EE UME.
- Possible user roles
  - Observer ➔ only monitoring
  - Operator ➔ & start / stop / relocate
  - Administrator ➔ & configuration.
- Authorizations can be applied to individual users.
ACC – Configuration of Network, Pool, Servers

- Network / Pool
  - Netmask, Broadcast Address, Pool Name
- Servers
  - Pool, NW interface, Network, delivered SAPS
SAP Instances

Virtual Hostnames, Network, Pool, required SAP and Memory, OS, Storage
ACC – Configuration of Filesystems

Filesystem Settings:

- Network Filesystems:
  - Storage type: NETFS
  - sapacosprep plattform library is required.

- Distributed-/Cluster Filesystem:
  - Storage type: DFS
  - sapacosprep storage library is required.

- LUN based FC or ISCSI Storage:
  - Storage type: SR
  - sapacosprep storage library is required.
A User Exit is

- A possibility to call external functionality on a single computing node, directly before or after an SAP instance has been started or stopped.

Exit Position

- Pre execution service start.
- Post execution service start.
- Pre execution service stop.
- Post execution service stop.

Exit Return Code

- The return codes are written to the operation log of the ACC.
  
  - 0 = OK
  - 4 = Warning
  - Else = Error
User Exit – Implementation I

Turn on User Exit:
- Template Configuration
- Mark “Execute User Exit Scripts

Preparation in the OS:
- Define Profile Parameter in /usr/sap/hostctrl/exe/host_profile
- Create exit script
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Integrate Dialog Instances in ACC: (CI and DB unchanged).

- Install new DI’s on virtual hostnames for the AC landscape.
- Integrate the new DI’s into the ACC.
- Manage with logon groups the user move to the new instances.
- Delete the traditional installed DI’s after the user are relocated.
  ➔ no interruption of the operation.
Integrate Dialog & Central Instances in ACC: (DB unchanged).

- Move CI to virtual hostnames.
- Install new DI’s on virtual hostnames.
- Integrate the new DI and CI into the ACC.
- Delete the traditional installed DI’s after the user are relocated.
  ➔ DB is unchanged.
Integrate Dialog, Central & DB Instances in ACC:

- Move CI and DB to virtual hostnames.
- Install new DI’s on virtual hostnames.
- Integrate all instances into the ACC.
- Delete the traditional installed.

⇒ Full benefits of the Adaptive Computing concept.
Planning Recommendations for AC Landscapes (1)

- SAP System No. and IP Services:
  - SAP System number is mapped into the IP Service Port.
  - No possibility to start two SAP Instances with the same SAP System number on one server.
  - In an AC landscape each SAP instance can possibly be started together with each other instance within one AC Pool.
  - Plan the SAP System No. for instances within one AC Pool.

- Virtual Hostnames:
  - Each SAP Instance in an AC Landscape needs an own virtual hostname.
  - Naming-proposal: `<Service Type>[<Number>]<SID>[<Network>]`
    e.g. cic02-server (Central Instance with SID C02 in the server network)
Planning Recommendations for AC Landscapes (2)

- User ID’s on UNIX OS:
  - User ID no. for the different <SID>adm users needs to be unique in the AC landscape.
  - A unique user ID no. for two different users mounted to the same server would mix up the file ownership.
  - Plan the user ID no. for the <SID>adm users within the AC landscape.
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<tr>
<th>Current Infrastructure</th>
<th>Adaptive Computing</th>
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<td>Installation per server</td>
<td>Service available in the network</td>
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<td>Individually Infrastructure &amp; operation</td>
<td>Standardized Building blocks</td>
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<td>Sizing per component/peak</td>
<td>Shared resource model possible</td>
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<td>High availability requires additional (expensive) hardware</td>
<td>Increased availability fundamentally included</td>
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<td>and increases complexity</td>
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Adaptive Computing Makes the Difference
Benefits in a Nutshell

Harmonization of IT-Landscape
- Use computing power and storage as shared resources for dynamic business needs

Flexibility and Scalability
- Satisfied Customers by high service levels
- High availability and reliability

Reduced Cost of Operations
- Simpler, less complex operations
- Ease of change
# ACC Survey: Examples

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<tr>
<th>Type of Task</th>
<th>Frequency (monthly/weekly/daily)</th>
<th>Duration of Task (hh:mm:ss)</th>
<th>Estimated Duration without AC</th>
<th>Frequency (monthly/weekly/daily)</th>
<th>Duration of Task (hh:mm:ss)</th>
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<td>Start/Stop of Dialog Instances</td>
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<td>00:00.50</td>
<td>00:03.00</td>
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<td>Relocation of Databases</td>
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<td>Software Maintenance (OS, patching etc.)</td>
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<td>Alternating System operation day/night shift</td>
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<td>Task planning for peak system use (month end, year end, campaigns etc.)</td>
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</table>

**Customer 1**

- Start/Stop of Dialog Instances: 3.6 x faster
- Relocation of Dialog Instances: 6 x faster

**Customer 2**

- Start/Stop of Dialog Instances: 12 x faster
- Relocation of Dialog Instances: 12 x faster
- Relocation of Databases: 12 x faster
- Hardware Maintenance (Server replacement, end of lease etc.): 12 x faster
- Software Maintenance (OS, patching etc.): 12 x faster
- Alternating System operation day/night shift: 12 x faster
- Task planning for peak system use (month end, year end, campaigns etc.): 12 x faster

---

**Spaces for additional savings with Adaptive Computing?**
Adaptive Computing Controller 1.0

... available today!

The Adaptive Computing Controller will be loosely coupled with SAP NetWeaver administrator infrastructure

Adaptive Computing Controller in SAP NetWeaver 7.1

...This benefits into an even more easy to administer, monitor and adaptive reaction on the fast changing business needs reflected in customer IT landscapes
What’s New with ACC 7.1

- Configuration for Servers and SAP instances are all done in the ACC
- Integration of today’s ACC agents into one common agent framework (ease of configuration and maintenance)
- Communication to the SAP system and agent framework via WebServices (no ssh any more)
- Improved service availability check
- SCS/ASCS managed as own SAP instance
- Additional Application Support
- Improvements of ACC usability
- Management of virtualized and non virtualized (traditionally installed) SAP instances
Adaptive Computing in a Virtualized IT World

Adaptive Computing
- Operate virtual and physical IT resources in an Adaptive Computing landscape
- Hide complex landscapes with the help of the Adaptive Computing Controller

Virtualized SAP Application

Virtual Server

Physical Server

Storage System

Network
Future Topics for 2008 / 2009

ACC Enhancements:

- Enhancement of ACC toward virtualization
  - Virtual and Physical landscape map
  - Management capabilities
- Dialog Instance Provisioning in an Adaptive Computing landscape
  - A Dialog Instance will be provisioned without pre-installation
- Emergency Operation
  - ACC via “command line”

ACC Improvements:

- Ease of configuration
  - reduce configuration steps
- Improvement of the ACC handling
  - Forced Shutdown of instances
  - Dry-Run capability (simulation of ACC tasks)
  - UI improvements
- SAP Instance Support
  - Replicated ENQ Support
SAP Book – Adaptive Computing

- Publisher: Galileo Press
- ACC related content bases on ACC 1.0
Newest information can be found on https://www.sdn.sap.com/irj/sdn/adaptive

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