HP Competent Cluster Service (HPCCS) for SAP on Windows - Release .NET Version 1.1

Customer Solutions Guide

Document Change Log

Changes since

- Initial Version 1.0 / 1.1. – 1.Jun 05: built on internal SG v1.3.

Service Overview

Customer's enterprise core business processes rely on the stability and performance of their SAP solutions environment. In the past, the standard two-node single SAP instance cluster solution has been used for the majority of typical Microsoft Windows customers looking for a high availability solution, but this has limitations. It is not flexible enough and does not allow the utilization of all server resources. Such a cluster requires the equivalent of an idle server, waiting, to be available in case of a failover. It also does not support clusters with multiple SAP instances.

The HP Competent Cluster Service (HP CCS) allows effective use of all available cluster resources and the usage of multiple SAP instances within a single Microsoft Windows 2003 cluster. The configuration is based on Windows Server 2003 Enterprise Edition, Datacenter Edition, and the Microsoft Cluster Service (MSCS) in its 32-bit and 64-bit versions.

Customers can adapt their IT landscape to changes in business situations, as well as lower their total cost of ownership through IT consolidation and through more efficient server use, especially when migrating from SAP R/3 to mySAP ERP, for which the application platform SAP NetWeaver is indispensable. Such landscapes also can be clustered with the help of HP Competent Cluster Service.

On the basis of an HP Mission Critical Support contract (Proactive 24 for SAP, Critical Service for SAP, or higher), HP Competent Cluster Service offers an intelligent, cost-effective, high availability solution for SAP landscapes on Microsoft platforms. It includes on-site installation, testing, customer training, and "going live" check. It provides for an assigned SAP-trained account team, an individual HP Account Support Plan, phone-in support, tool updates, proactive monitoring and support for the clustered IT environment, with support processes in close cooperation with HP strategic partners SAP and Microsoft.

Introduction

With the availability of the R/3 3.1I installation Kit, SAP supports the installation of Microsoft clustered SAP systems. The standard SAP cluster configuration comprises a two-node cluster configuration with a clustered SAP CI and DB.

In the UNIX world, the UNIX vendor has to provide and support cluster scripts that enable the monitoring and failure recovery of the R/3 central instance services, whereas in the Microsoft world, SAP provides all software and installation documents required for the installation and operation of a standard SAP central instance in a Windows cluster.

The SAP standard, two-node single SAP instance, cluster solution has been sufficient for the majority of typical Windows customers looking for a high availability solution. One of the primary advantages of the SAP Microsoft cluster solutions is that this solution is standardized and the same on all different hardware platforms that run Windows.

Today, due to its implementation restrictions, this solution tends to impose limitations on larger SAP installations on Windows or installations that need more deployment flexibility. Enterprise customers in need of a more flexible cluster solution soon reach the configuration limitations of the standard cluster solution supported by SAP.

This document describes cluster configurations, products and service offerings from HP, designed to provide SAP customers with a similar level of flexibility and support offerings in the Windows high availability area that HP customers are accustomed to in the UNIX world.

The HP Competent Cluster Service for SAP on Windows enables customers

- to deploy their SAP landscape more flexibly,
- to consolidate SAP applications,
- to cut costs in reducing hard and software license costs.

UNIX vs. Windows – SAP cluster feature comparison

The standard cluster solutions and features for UNIX and Windows are basically the same. Both operating systems use a special program (cluster service or daemon) that monitors the health of the cluster node and clustered applications. When an application fails due to a software or hardware problem, the cluster service will detect this failure and will automatically start to recover the failing application. The application recovery process depends on the failure and includes an application re-start on the primary node as well as an application failover and re-start on the failover node.

Table 1 - UNIX vs. Windows – SAP cluster features

Windows	UNIX	Cluster Node 1	Cluster Node 2	Cluster Node n (max. 8)
þ	þ	CI	DB	-
		failed	CI+DB	-
ý	þ	CI + DB	AS	-
		failed	~~AS~~ CI +DB	-
ý	þ	CI	DB	Idle
		failed	DB	CI
ý	þ	CI	DB	AS
		failed	DB	~~AS~~ CI
ý	þ	CI	DB	AS
		failed	CI + DB	AS
ý	þ	CI + DB	AS	AS
		failed	AS + CI	AS + DB
ý	þ	CI1 + DB1	CI2 + DB2 (e.g QA)	-
		failed	~~CI2 + DB2~~ CI1 + DB1	-
ý	þ	CI1 + DB1(Prod.)	CI2 + DB2 (e.g QA)	AS
		failed	CI2 + DB2 (e.g QA)	~~AS~~ CI1 + DB1 (Prod.)
ý 32-bit ý 64-bit	þ	CI1 + DB1 + CI2 + DB2	CI3 + DB3 + CI4 + DB4	-
		failed	CI1-4 + DB1-4	-
ý 32-bit ý 64-bit	þ	CI1 + DB1 + CI2 + DB2	CI3 + DB3 + CI4 + DB4	AS
		failed	CI3 + DB3 + CI4 + DB4	~~AS~~ CI1-2 + DB1-2

CI = Central Instance, DB = Database, AS = SAP Web Application Server, Prod = Productive System, QA = Quality Assurance

UNIX cluster solutions support more varied and more flexible cluster configurations than the SAP on Windows cluster solution. For instance, a typical UNIX cluster solution for SAP supports multiple independent clustered SAP central instances within a single cluster or additional SAP application

servers (DI) within the cluster to utilize the resources of all cluster nodes. These configurations are currently not supported with Windows-based clusters by SAP. For more information on supported Windows and UNIX cluster features, please review the SAP and hardware vendor cluster documentation.

Table 1 summarizes some of the possible and supported Windows and UNIX SAP cluster configurations. Rows starting with “failed” describe the status of the nodes after a failover.

Table 1 illustrates that UNIX-based cluster solutions are more flexible than the SAP supported Windows cluster solution. The difference is that the support for such configurations comes from the UNIX and hardware vendors and not – as in the case of Microsoft Windows – from SAP.

Business needs

With the availability of Windows operating system versions for 64-bit server platforms like the HP Integrity or Superdome server lines, there is a growing market share of business critical applications migrating from proprietary or UNIX environments to the Microsoft platform. Before any migration, customers usually perform an in-depth comparison between those environments of the features and an analysis to determine whether their critical business needs are sufficiently supported.

Complementarily, the typical Windows 32-bit customer has become increasingly price sensitive and wants to get the most out of the hardware and software resources of all server systems. Maximum utilization of all hardware resources and system consolidation are therefore key business drivers for the HP Competent Cluster Service on Windows.

The SAP standard cluster solution does not support these trends; it lacks some flexibility and does not allow the utilization of all server and software resources of the cluster nodes. In particular, the standard failover management uses a lot of hardware redundancy, and the standard of a single SAP instance per system ignores the huge potential of 64-bit resource management.

Addressing this situation, HP provides the customer with exactly the high availability solution and support offerings they need with HP Competent Cluster Service. In particular, HP CCS offers a smart and efficient failover management that optimizes the hardware resources and in addition offers a multi-instance feature which allows system consolidation. Both features alone already add significant value; combined together they provide a powerful tool to design consolidated landscapes, in which multiple nodes are protected by one strong consolidated multi-instance node.

A variety of detailed business cases are suggested at the end of this document.

UNIX vs. Windows – HP cluster feature comparison

The HP Competent Cluster Service for SAP on Windows overcomes the limitations of the SAP standard cluster solution. HP provides support for up to 8* cluster nodes running on a Windows 2003-based cluster system. The customer has the choice of installing additional SAP application servers or even multiple and independently-running SAP central instances (ABAP) and Java central services (only one) on all cluster nodes.

Table 2 - UNIX vs. HP CCS cluster features on Windows

HP CCS on Windows	UNIX	Cluster Node 1	Cluster Node 2	Cluster Node n*
þ	þ	CI	DB	-
		failed	CI+DB	-
þ new	þ	CI + DB	AS	-
		failed	~~AS~~ CI +DB	-
þ new	þ	CI	DB	idle
		failed	DB	CI
þ new	þ	CI	DB	AS
		failed	DB	~~AS~~ CI
þ new	þ	CI	DB	AS
		failed	CI + DB	AS
þ new	þ	CI + DB	AS	AS
		failed	AS + CI	AS + DB
þ new	þ	CI	AS	AS
		failed	~~AS~~ CI	AS
þ new	þ	CI1 + DB1	CI2 + DB2 (e.g QA)	-
		failed	~~CI2 + DB2~~ CI1 + DB1	-
þ new	þ	CI1 + DB1(Prod.)	CI2 + DB2 (e.g QA)	AS
		failed	CI2 + DB2 (e.g QA)	~~AS~~ CI1 + DB1 (Prod.)
ý 32-bit þ 64-bit new	þ	CI1 + DB1 + CI2 + DB2	CI3 + DB3 + CI4 + DB4	-
		failed	CI1-4 + DB1-4	-
ý 32-bit þ 64-bit n	þ	CI1 + DB1 + CI2 + DB2	CI3 + DB3 + CI4 + DB4	AS
		failed	CI3 + DB3 + CI4 + DB4	~~AS~~ CI1-2 + DB1-2
ý 32-bit þ 64-bit, n	þ	CI1 + DB1	CI2 + DB2	AS1 node3 AS2 node4
		failed	failed	AS1 and CI1 + DB1 AS2 and CI2 + DB2

CI = Central Instance, DB = Database, AS = SAP Web Application Server, Prod = Productive System, QA = Quality Assurance

*Please consult the UNIX vendor documentation for Unix node limitations. Today, standard Microsoft Cluster Service supports up to 8 nodes per cluster. Currently SQL Server 2000 has a limit of four cluster nodes, which is removed by the SQL Server 2005 soon to come. Current Oracle databases can cope with 8 cluster nodes.

Table 2 summarizes HP-supported Windows configurations versus a number of common UNIX SAP cluster configurations. In this table, rows starting with "failed" describe the status of the nodes after a failover.

Table 2 shows that the HP-supported Windows SAP cluster solutions now provides a level of functionality and flexibility close to an UNIX-based SAP cluster solution. Please be aware that multiple SAP instances on one node are only supported with Windows 64-bit (solution10 and 11)! Also, all described solutions can be installed and operated without the database in the same cluster.

Depending on the actual need and concept the customer may operate the SAP database outside the cluster!

Solution details

The solution is based on standard components such as the Microsoft cluster service and the SAP cluster extensions for the ABAP central instance (CI) and the J2EE system central services (SCS). This ensures the support from Microsoft and SAP for their components.

The HP Competent Cluster Service toolkit for Windows consists of 2 main components:

- a cluster resource manager service to manage system failover (HP CCS Resource Manager)
- Multi-Instance Cluster (MIC) configuration guidelines with enhancements to the SAP standard cluster configuration.

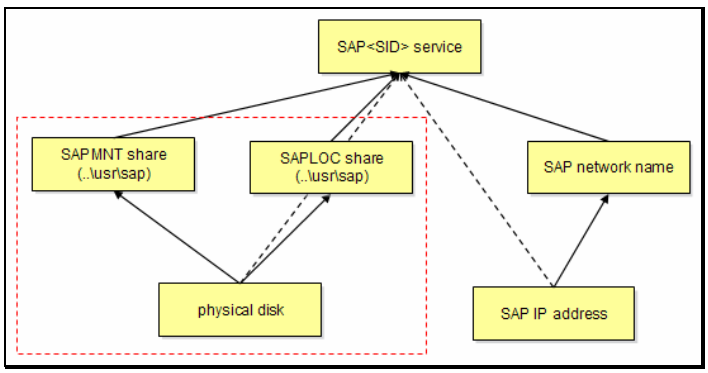
HP CCS failover management

HP provides a special toolkit that manages the failover process and ensures that a failing SAP production system will have all required resources available on the failover node. This toolkit is based on the Microsoft .NET framework and therefore runs on the 32-bit as well on the 64-bit versions of Windows 2003 Enterprise Server and above.

HP multi-instance cluster configuration for SAP

If multiple independent SAP instances should run in a cluster, then (in addition to the use of the toolkit), SAP needs to be deployed in a special way on the cluster.

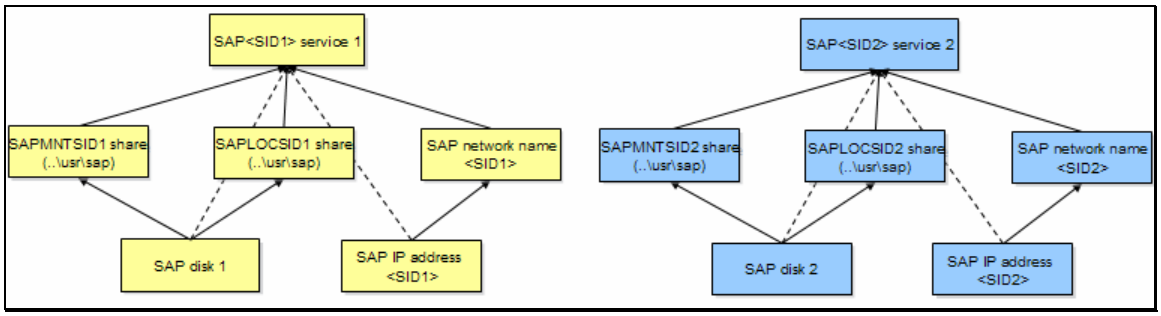
Figure 1 - SAP cluster resource dependency



The cluster resources, e.g. SQL or SAP, can only fail over to the specified failover or standby node. This ensures that, in a multiple SAP instance configuration, the failed resource can only fail over to the

specified cluster node and therefore does not affect applications running on the other non-specified cluster nodes.

Figure 2 - Multi-instance SAP cluster resource configuration



Database multi-instance cluster configuration

In addition to the changes in the SAP cluster configuration, it is necessary to install the SQL SAP database as so-called named instances.

It is recommended to use a dedicated SQL server service per clustered SAP instance. A MCOD configuration is not recommended in a cluster environment since this may lower the overall system availability of the clustered SAP instance.

If only one SAP instance is deployed in a Windows-based cluster, these configuration changes are not necessary!

Configuration details

- Depending on the nature of the solution used (cf. Table 2), the installation may require the conversion to a so-called SAP MIC configuration. This conversion is required so that multiple SAP central instances can be installed and operated within a cluster.
- If only an application server or a local installed QA system is to be installed in the cluster besides the central instance, the conversion to an MIC configuration is not needed.
- For both options, the installation of the SAP system (CI and DB) itself remains unchanged and the installation is as described in the SAP installation manual.
- Before an additional SAP central instance can be installed within the cluster, an MIC conversion of the existing SAP central instance must be performed.
- The re-conversion from an MIC installation to a normal SAP installation may be necessary in certain situations, such as SAP patch tool compatibility or troubleshooting. The re-conversion to a standard SAP configuration can be done in minutes.
- One SAP license key is needed per cluster node and SAP instance, e.g. a 3-node cluster with 2 SAP instances needs 4 SAP license keys (2 per SAP instance).

Supported operating systems

- Windows Server 2003, Enterprise Edition for 32-bit systems
- Windows Server 2003 Enterprise x64 Edition (EM64T and Opteron)
- Windows Server 2003 Enterprise Edition for 64-bit Itanium-based systems
- Windows Server 2003 Datacenter Edition for 64-bit Itanium-based systems

Supported databases

- MS SQL Server 2000 32- and 64-bit and above, database must be installed as a named instance
- other databases like Oracle 9.x., liveCache or MaxDB 7.x upon request.
- MaxDB or liveCache can only be installed one time in a cluster! No support for so-called active-active database cluster configurations!

SAP application support

Basically, all SAP kernel based products, starting with SAP kernel 4.x for 32-bit systems and 4.6x for 64-bit systems, can run in a multi-instance cluster configuration:

- SAP 4.6C kernel based products and higher releases
- WAS 6.20 kernel based products and higher releases
- SAP APO LiveCache 7.4 and higher releases
- SAP XI 3.0

Combinations of categories within a cluster are not recommended at present. No support is provided for applications that SAP has classified as non-compatible or non-stackable.

For more information on SAP system consolidation, refer to SAP OSS note 28392.

Note: SAP Net Weaver 2004 components are not generally released for high availability setups, product support is still only on project base. Please follow SAP OSS note: 803018 - Central note for NetWeaver04 High Availability capabilities.

This is the current SAP support status (May 2005) and has nothing to do with the HP CCS solution, but the general SAP cluster setup and software!

J2EE SCS cluster support

With the release of the J2EE SP9 engine, HP and SAP support the installation and operation of the Java System Central Services (SCS) within a cluster.

Currently, the SCS is only supported on a single instance cluster. Neither SAP nor HP support multiple SCS instances on a single cluster.

Cluster node limitations

The following limits are currently imposed by either Microsoft Cluster Service or the database engine:

- Microsoft Cluster Service on Windows Server 2003 allows up to 8 nodes in a cluster.
- Microsoft SQL Server 2000 allows up to 4 databases linked in a cluster configuration.
- Microsoft SQL Server 2005, when available, will allow up to 8 databases linked in a cluster configuration
- Oracle database on Windows Server 2003 allows up to 8 databases linked in a cluster configuration

HP CCS Resource Manager

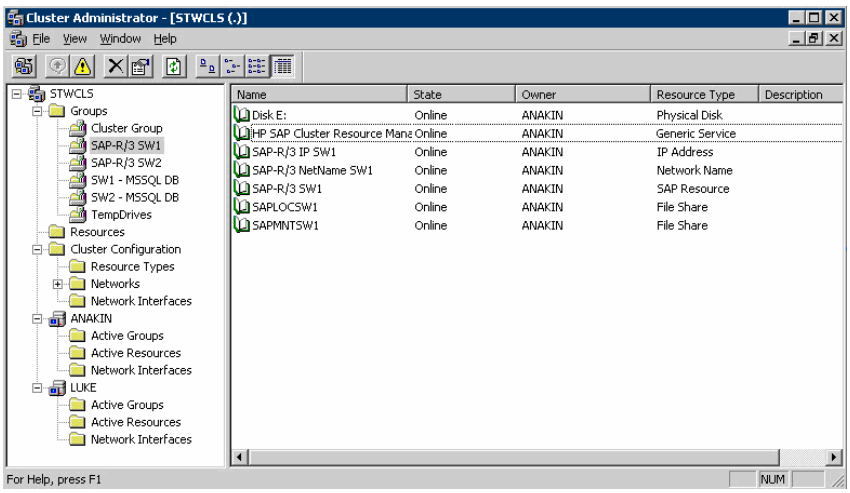
Depending on the customer's requirements and the HP SAP cluster solution chosen by the customer, the installation of the HP CCS Resource Manager provides assistance. This program will terminate any running services, such as an additional SAP application server instance or a database, to free up the needed resources on the failover cluster node. Additionally, the manager provides dynamic SAP or database start profiles to support inhomogeneous cluster nodes (e.g. one 8-way and one 4-way nodes).

The HP CCS Resource Manager is a tool developed by HP specifically for extending the standard SAP cluster solution or the multi-instance cluster solution by providing the flexibility customers demand today. This manager provides following features:

- Local SAP application server support within a cluster
- Local QA or Def SAP and database system support within a cluster
- Dynamic SAP start profiles
- Dynamic database start profiles
- Automatically restoration of any changed profiles to the original profiles on the primary node
- Inhomogeneous cluster nodes (different memory and CPU sized server systems)
- Flexible termination of any program / service on the failover node
- Cluster group "take-offline" and "move-to" support
- Start of an external customizable script on the primary and failover node
- Extensive event logging
- Full customization via an XML configuration file
- Running as a Windows service

The HP CCS Resource Manager is required when applications like SAP or SQL must be terminated on the failover node to free up system resources, or if the SAP / DB profiles need to be modified after a failover.

Figure 3 - HP CCS Resource Manager



The solution design allows customers to choose the approach that is appropriate for their unique SAP environment. Customers are free to choose whether to deploy only the HP CCS Resource Manager for SAP or additionally the HP SAP multi-instance cluster configuration.

Customer benefits

The HP Competent Cluster Service for SAP on Windows provides a much broader level of deployment and operation flexibility than the standard SAP cluster solution. Additionally, HP Services provides implementation and operation services and consultancy offerings.

Benefits

HP Competent Cluster Service for SAP on Windows can benefit customers in the following ways:

- Reduced hardware costs
- Reduced software license costs
- Reduced operation and service costs
- Better utilization of cluster hardware
- Consultancy, service and support offerings from HP
- Increased system availability due to HP support and implementation
- Defined support and escalation paths (fully integrated into HP SAP support contracts)

Example1:

If a customer wants to protect two productive SAP systems, then normally two independent cluster systems with in total 4 cluster nodes are needed. With the HP-supported multi-instance cluster solution one dedicated cluster node can protect the two SAP systems and lower therefore the initial hardware and software costs by 25%.

Table 3 – Cost savings through multi-instance

Cluster	Failover Node	Redundancy level	Less needed nodes	MIC costs	Cost savings	Normal Costs when deployed in the standard way
2-node cluster	1	50%	0	100%	0%	100%
3-node cluster	1	33%	1	75%	25%	100%
4-node cluster	1	25%	2	67%	33%	100%
5-node cluster	1	20%	3	63%	38%	100%
6-node cluster	1	17%	4	60%	40%	100%
7-node cluster	1	14%	5	58%	42%	100%
8-node cluster	1	13%	6	57%	43%	100%

In the case of an 8-node cluster up to 7 productive SAP systems can be protected with a single failover node. In this case the initial cost savings are up to 43%. In such a configuration, up to 7 systems may failover to the dedicated failover cluster node. Some customers may require more dedicated failover nodes to achieve a higher redundancy ratio.

Please be aware that the redundancy level decreases with the amount of productive cluster nodes in a MIC cluster. More then one dedicated failover node may be required to fulfill customers high availability requirements.

Additional costs savings are lower TCO due to lower operation and maintenance costs and the possibility of using the HP CCS Resource Manager to allow the installation of an application server or a QA system on the failover node.

Example2:

A customer wants to protect the productive SAP central instance and database. While using the SAP standard configuration the cluster nodes must be sized for the load of the DB and CI. This leads to under-utilized server cluster nodes. When using the HP CCS Resource Manager the 2nd node can be used as the QA system or as an additional SAP application server. SAP demands that its customers have a QA system that is similar to the productive system. Therefore the 2nd cluster node would perfectly match this requirement. In case of failure, the QA system on the failover node would be stopped to release the used system resources. Once stopped the productive SAP system and database would be restarted on this node. This saves the customer the costs of a QA or application server system.

Costs savings due to the usage of all server hardware and resources in the cluster!

Support status

Cluster / failover support

SAP supports only the standard SAP cluster configuration on Windows. Everything that is different from the standard cluster configuration defined by SAP is not supported by SAP and its support organization.

Nevertheless, SAP provides and supports the SAP Windows cluster extensions (DLLs) for ABAP and J2EE, the installation routines and documentation on how to install a standard SAP Windows-based cluster system.

Multi-instance support

Due to the variety of possible combinations, HP requires that interested customers obtain a positive SAP statement for the applications that they plan to run and consolidate on a single server and OS image. The SAP statement ensures that the customer can run and operate the chosen applications without any problems and possible resource conflicts due to incompatible software components.

HP supports only the conversion of compatible software components to a multi-instance cluster configuration. No support is provided for applications that SAP has classified as non-compatible and non-stackable.

For multi-instance cluster solutions that use a dedicated failover node or where the second SAP instance is switched off (e.g. QA system), this is not required. (This is the standard case).

Mandatory HP support agreement (P24/CS for SAP)

HP Services provides an extended proactive 24 hrs support service that includes SAP and Microsoft cluster support offerings, HP Proactive 24 for SAP, Critical Service for SAP, or higher. The support for HP Competent Cluster Service for SAP on Windows is integrated into existing proactive service agreements (P24/CS for SAP). These service agreements are a mandatory prerequisite for HP CCS to fill the above described SAP and Microsoft support gaps and to proactively maintain the critical environment.

Additional benefits from P24/CS for SAP agreements are:

- an SAP-trained account team
- patch assistance by the HP SAP Response Center Team (SAP RCT)
- accelerated HP-SAP troubleshooting and escalation: cooperative processes, identified teams, rapid information exchange, collaboration on problem resolution.
- trend analysis: periodic checks by the SAP RCT on system resource utilization
- capacity planning: annual analysis and review on the basis of the trend analysis
- performance analysis: deeper investigation and identification of problems revealed through the trend analysis
- storage performance analysis
- and more.

For the regional availability of the required HP service agreements, please contact your local HP Services account team.

The availability of support agreements for the HP Competent Cluster Service may differ from country to country.

HP Competent Cluster Service includes technical consulting and testing by the HP Technology Services engineer. Prior to going live in production, HP must perform a final check and confirm the supportability of the implementation of HP CCS.

Solution implementation steps for SAP consolidated systems

The consolidation of SAP applications on a single OS image requires the usage of 64-bit hard- and software. HP recommends their Integrity server line for such consolidation projects. The new HP server systems with 64-bit extended CPUs from AMD and Intel can also be used.

A successful implementation and operation of an SAP consolidated landscape on a Microsoft cluster requires the following implementation steps:

1. Consolidation phase
    a. Selection of the applications to be consolidated (i.e. SAP kernel products).
    b. Positive SAP support statement on the applications that will be consolidated. Applications that SAP has classified as non-compatible and non-stackable can not be consolidated.
    c. Consolidation and testing of the applications for any problems.
    d. If everything works and is supported by SAP, it can be clustered.
2. Cluster phase
    a. Installation or migration of an existing consolidated SAP system to a multi-instance cluster configuration.
3. Test phase
    a. After the applications have been converted, the failover process and all general SAP functions must be tested.
    b. Adding of application servers possibly needed.
    c. Testing of the overall system landscape.
4. Operation phase
    a. The operation of an MIC system is generally the same as with a standard SAP system.
    b. In some rare cases (like patch management), a reconversion of the instance to patch to a "normal SAP cluster system" may be required. The reconversion of a single SAP MIC instance to an SAP standard configuration can be accomplished within 5 minutes.

The above project phases will ensure the proper installation and operation of an infrastructure that is supportable by HP (cluster part) and SAP (SAP software part).

ABAP CI MSCS Cluster

The ABAP CI MSCS cluster is the traditional SAP cluster implementation on the Microsoft cluster service.

SAP provides the cluster DLLs required for installing SAP within a homogeneous cluster system. R/3 itself is not affected by these extensions, which means that every existing SAP R/3 system on Windows NT, 2000 and Windows Server 2003 (version 3.1I or later) can easily be upgraded to a clustered installation.

The cluster extensions and SAP software are available in a 32-bit and in a 64-bit version.

In addition to the clustered SAP ABAP CI, several SAP application server systems that build an SAP logon group are required to provide a high available infrastructure for the SAP clients.

HP-supported SAP cluster configurations

The following cluster example configurations are part of the HP Competent Cluster Service for SAP on Windows cluster configurations. Variations of the described solutions are possible, but only SAP and database applications are supported in the cluster. SAP applications may not be clustered with any other software application like Exchange.

All described cluster installations must have at least one (and should preferably have two) SAP application servers in front of the cluster. Clients should normally not connect directly to the cluster!

All solutions described in this section can be installed and operated without the database in the same cluster. The customer is free to choose where to place the database. This supports current trends in data mining and consolidated central database systems.

Depending on actual needs and concepts, the customer may operate the SAP database outside of the cluster.

The SAP cluster configurations will only protect the ABAP CI and – where applicable – the J2EE SCS.

Although not limited to this, it is recommended to group only systems with the same database and/or the same SAP kernel releases.

Solution 1 – two-node cluster configuration with a single SAP CI

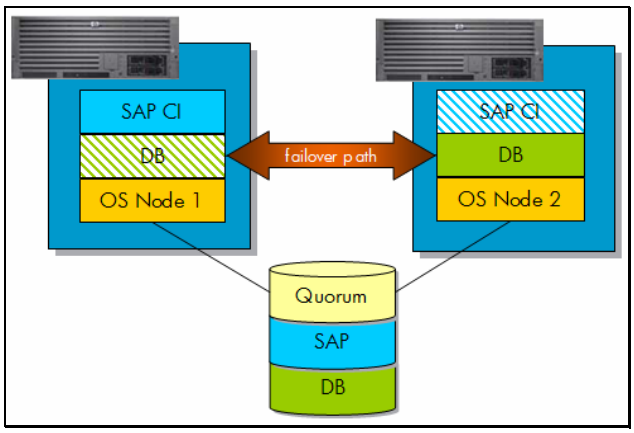
Pros:

- Fully supported by SAP => standard SAP cluster installation
- Standard installation, installation guides and cluster extensions are available from SAP
- HP and SAP service and consulting offerings are available

Cons:

- Only one SAP instance within a cluster
- System oversizing, systems must provide resources for the SAP CI and DB
- Poor hardware utilization
- Expensive due to server under-utilization

Figure 4 - SAP standard cluster configuration



Description

SAP CI (ABAP) is active on cluster node 1, while the database is active on node 2. System utilization is low due to hardware oversizing. In the application failure case, the cluster service first tries to restart the failing application. If the application still fails or if the cluster node is defective, the “SAP CI” or the “DB” will failover to the remaining cluster node.

This is the standard SAP on Windows cluster solution.

Solution 2 – two-node (in-) homogeneous cluster node configuration with a single SAP CI and an additional SAP application server or QA system

Pros:

- Standard installation, installation guides and cluster extensions are available from SAP
- Better system utilization with the additional SAP AS or SAP QA system on the other node
- Lower hardware costs due to support for different sized cluster nodes
- HP service and consulting offerings are available

Cons:

- No SAP support due to enhancements of the standard AS installation routine

=> The HP Competent Cluster Service toolkit is needed to control the failover of the production environment and the shutdown process of the SAP AS or QA system.

Figure 5 - Two-node inhomogeneous cluster with AS

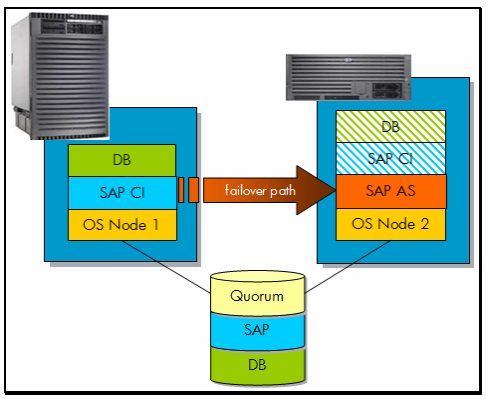
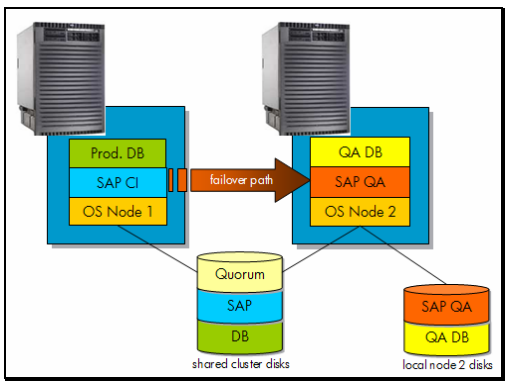


Figure 6 - SAP application server node after failover



Description

This solution supports homogeneous or inhomogeneous (different sized) cluster nodes. SAP CI and DB are active on cluster node 1, while an additional SAP application server (DI) or local installed QA system is active on cluster node 2. This configuration fully utilizes both cluster nodes. In case of a failure, the cluster service first tries to restart the failing application. If the application still fails or if cluster node 1 is defective, the SAP CI and DB will failover to the failover cluster node.

The SAP Quality Assurance (QA) is installed locally on the failover node and will be terminated after a failover of the productive SAP instance.

The HP CCS Resource Manager, which runs in the cluster, ensures that the SAP AS or SAP QA (CI and DB) system running on node 2 is shut down before the cluster service restarts the SAP CI and DB on cluster node 2.

Additionally to this the HP CCS Resource Manager is able to enhance the SAP start profiles to ensure that possible different sized hardware can be used. The SAP AS will never failover to the SAP CI cluster node 1. Node 2 is the failover node for the SAP CI and DB.

This HP-supported solution saves one application server system or a full QA system.

Solution 3 – multi-node cluster configuration with multiple SAP central instances (via MIC) and an additional SAP application or QA system

Pros:

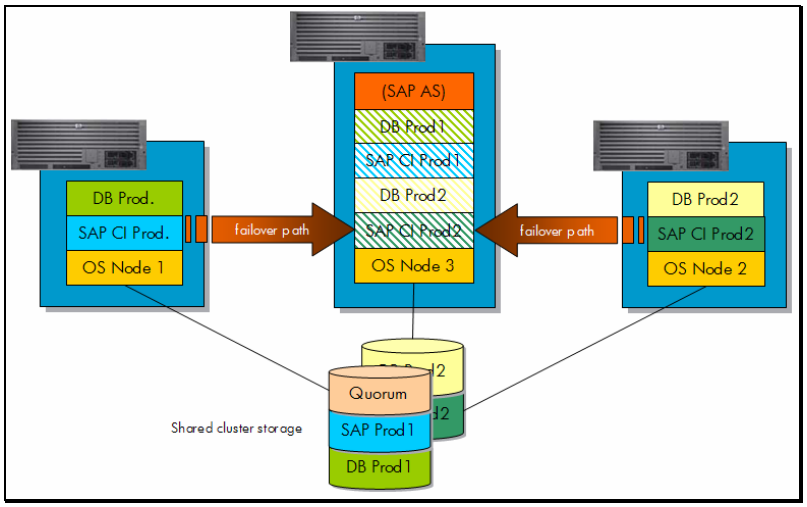
- Customers can install a QA system or SAP application server system on the cluster node that protects the production system(s) – this reduces hardware costs
- Homogeneous sized server systems – no oversizing
- HP service and consulting offerings are available

Cons:

- No SAP support due to enhancements of the standard SAP installation (MIC conversion)

=> The HP Competent Cluster Service toolkit is needed to control the failover of the production environment and the shutdown process of the SAP AS or QA system.

Figure 7 - Multiple SAP instance cluster (via MIC) with standby / application server node



Description

The first step is to install a so-called named SQL instance. A named instance is required if more than one independent ACP system are installed in the cluster. After the SAP standard installation and SAP cluster conversion of the first SAP system, the MIC conversion must be performed. Once the conversion of the first instance is done, the second SAP instance can be installed within this cluster. After the installation and configuration, this instance must also be converted to a clustered MIC installation. Upon failure, prod1 or prod2 will failover to the dedicated failover node. This node may have an additional application server installed. If an application server is installed, the HP CCS Resource Manager must also be installed to shut down any application server prior to the re-start of the failed SAP productive instance.

Depending on the resources available, the standby node may have more than one application server installed or even a QA system with database. In the above example, two application server instances for prod 1 and 2 or an QA system may be installed.

This HP-supported solution saves some application server systems for the overall system landscape or a server for the QA system.

Solution 4 – four-node 64-bit cluster configuration with multiple SAP central instances (via MIC) and additional application servers

Pros:

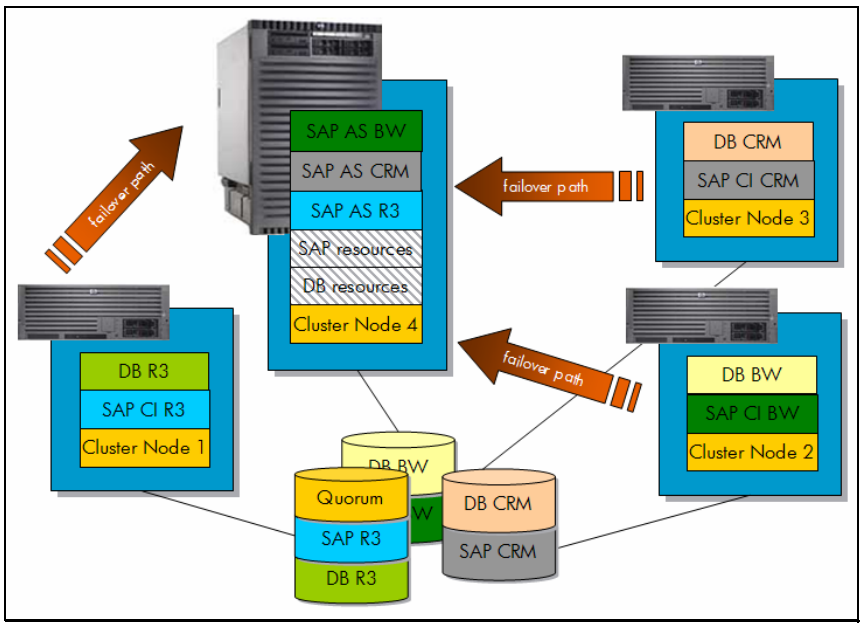
- Customers can install a QA system or SAP application server system on the cluster node that protects the production system(s) – this reduces hardware costs
- Homogeneous sized server systems – no oversizing
- HP service and consulting offerings are available

Cons:

- No SAP support due to enhancements of the standard SAP installation (MIC conversion)

=> The HP Competent Cluster Service toolkit is needed to control the failover of the production environment and the shutdown process of the SAP AS or QA system.

Figure 8 - Four-node 64-bit cluster configuration with multiple SAP instances (via MIC) and one dedicated failover node



Description

The primary benefit of this example is that a customer would be able to cluster the complete SAP environment. During normal operation, each SAP instance runs on its dedicated cluster node. Only in the event of a failure would it run on the failover / application server node.

Depending on the customer's specific needs, the failover node provides only additional resources for one failing SAP instance. The running application server instances may be switched off in the case of any resource conflicts or if more than one production instance has failed.

On the dedicated failover node application server instances or a QA system can be installed. This example configuration saves two cluster nodes, since only 4 systems, instead of 6 systems, are needed.

Solution 5 – two-node Superdome 64-bit cluster configuration with multiple SAP central instances (via MIC)

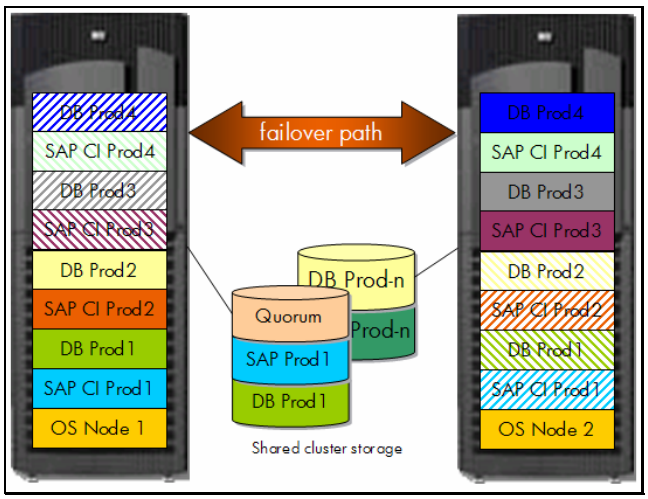
Pros:

- Reduced costs due to system consolidation
- High availability solution for consolidated systems
- Homogeneous sized server systems
- Very good hardware utilization and deployment flexibility
- Optionally, the HP CCS Resource Manager can be used for altering and modifying the start profiles
- HP service and consulting offerings are available

Cons:

- No SAP support due to enhancements of the standard SAP installation (MIC conversion)
- Unused resources due to system oversizing (when not controlled via HP CCS Resource Manager)
- Possible software release dependencies
- Only SAP-approved applications can have software consolidated

Figure 9 - Two-node Superdome 64-bit cluster configuration with Multiple SAP Instances (via MIC)



Description

Multiple independent SAP instances that are consolidated on a 64-bit Itanium server system can be clustered with the HP Competent Cluster Service for SAP on Windows. This multi-instance configuration provides failure tolerance for all implemented SAP and database instances running on the server node. Both nodes are active but have resources preserved for any applications that failover from the other cluster node. The SAP systems can be consolidated on one hardware partition or distributed over dedicated hardware partitions.

The HP CCS Resource Manager is not required when enough server resources are available to support the failover and restart process of the failed application; however, it can be used for controlling the failover and re-starting the process of a failed application. The HP CCS Resource Manager can modify, for example, the start profiles of the SAP instances or the database to re-configure the applications for reduced resource utilization when these failover to the other node.

Appendix

Further documentation:

http://www.hp.com/go/SAP

http://service.sap.com

http://www.microsoft.com

Index of Figures: