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Overview

- The Problem Space
- Principles
- The Installable Unit Deployment Descriptor
- Relationship to ACS
- IUDD, what it is and what it isn’t…
- IUDD concepts, structure and capabilities
- Questions
- Summary
Problem Space

- Installation and configuration complexities must not become an impediment to adoption of grid technologies
- Installation and configuration needs are fundamental – little is unique to grid
- Grid, by definition, requires automation
  - Static configurations, tolerated in data center, can not be tolerated in grid
  - Standardized deployment descriptors increase reliability
- What standards can provide a foundation?
Principles

- For more complete autonomic functionality, the installation of OS and grid container must be automated and born from the network.
- Generic enough to apply to any computing container solution. Grid or otherwise.
- **Must** be able to deal with heterogeneous pools of hardware.
- An increasing percentage of software is aggregated as a component within a larger, integrated “solution”. Grid applications are, by definition, an aggregated solution.
- Customers outages are often caused by their inability to rollout changes to applications because of the complex interdependencies with other application components and products.
- In order to enable autonomic deployment and configuration management, standardized formats are needed for declaring the structure of a solution and dependencies among its software components.
  - Grid depends on the ability to dynamically deploy and configure solutions.
Installable Unit Deployment Descriptor Relationship to ACS

- **Application Contents Service** defines a repository interface (ARI) and format for contents of the repository (AAF)

- **While the requirements for a grid application archive** are unique to grid, the description of the contents are not

- **The description must define the application artifacts, dependencies, and deployment mechanisms**

- **Add software life cycle management** to the mix and you have the requirements for Installable Unit Deployment Descriptor (IUDD)

- **Only requirements difference** between AAF and IUDD are any wrappers needed for storage within ACS repository.
IBM, InstallShield (Macrovision), Zero G, and Novell collaborated on a set of specifications to

- “define the schema of an XML document describing the characteristics of an installable unit (IU) of software that are relevant for its deployment, configuration and maintenance.”

- Published by W3C on July 15, 2004
  - [http://www.w3.org/Submission/2004/04/](http://www.w3.org/Submission/2004/04/)
  - Made available to Industry under RF terms

- Publication coincident with announcements calling for formation of a standards workgroup to formalize an Industry standard for IUDD Schema.
IUDD – What it is… (cont.)

- **Scope**
  - Atomic installable units as small as mobile devices
  - to...
  - Enterprise scale applications that include services distributed over a Grid.
    - Designed for distributed heterogeneous environments
    - See Application Contents Service BoF

- **Standardization goal**
  - Have a single Industry standard to describe all aspects of a software solution needed to provide complete lifecycle maintenance.
    - IUDD specifications will be IBM’s submission to a formal workgroup.
IUDD – What it isn’t…

- Does NOT define the
  - Hosting platform information models
    - DMTF is responsible for these
      » (with input from other orgs like GGF)
  - Hosting platform management interfaces
    - OASIS WS-Distributed Management defining for WS
      » GGF CMM-WG provides Grid specific extensions
  - Deployment and Lifecycle Management engines
    - Typically proprietary or value-added
      » For example, see InstallShield and Zero G announcements
    - Open platforms, e.g. GGF, are defined by respective orgs
A solution may encompass inter-dependent Installable Units (IU) deployed across multiple hosting domains.

Target hosting domains (Op Systems, J2EE servers, Databases) and other external resources are each represented by a node in the solution topology.

The simplest solution has a single IU targeted at the only topology node. Example: AcrobatReader targeted to a Windows OS.

A topology node needs to be mapped to one or more instances of a resource (e.g. OS). The mapping is constrained by type and possibly additional selection requirements.

Installable Units declare dependencies (topology targets may also declare dependencies).

Requirements from all IU’s aimed to a given topology target include:
- hosting-environment dependencies (capacity, consumption, properties, relationships, etc)
- software dependencies (pre- co- and ex-requisites)

A solution may define bundled requisites that can be deployed on-demand to satisfy a software dependency.
Installable Units

- **SIU – Smallest Installable Unit**
  - Leaf node in the aggregation hierarchy
  - “Points” to bundled artifacts
- **CIU – Container Installable Unit**
  - Aggregate aimed at a single logical target (target may resolve to multiple instances)
- **SM – Solution Module**
  - Aggregated IUs may span multiple logical targets
- **Root**
  - Root of the hierarchy
  - Unit of packaging
IUDD – Root IU

- **Root IU is the Unit of packaging**
  - It is an Installable Unit
    - Base, Update or Fix
  - May include any other IU aggregate
- **Base and selectable content**
- **Topology**
  - Target definitions
- **Info**
  - Build #
  - Manufacturer
  - Size
- **Features and Groups**
  - Features select optional content
  - Groups are pre-defined sets of features
- **Bundled requisites**
- **Files** (included in the package)
  - Files referenced from within the IUDD
    - Artifacts
    - Other bundled root IU packages (IUDD)
  - Files referenced from within artifacts
Targeting, artifacts, bundled files

- **SIU (Smallest installable Unit)**
  - Leaf node in the hierarchy
  - Targeted to a hosting environment target (*WindowsOS*)
  - Identity, and dependencies
  - Deployable content (artifacts)
  - An aggregate IU (CIU, SM, root) does not have deployable content of its own.

- **Install Artifact**
  - Defines actions to be executed on the HE (*InstallMSIProduct*)
  - Referenced in the SIU definition as an external file
  - Artifact schema is HE specific
  - Actions in an artifact may reference bundled files (the MSI package in the example)
IU Identity

- IU Identity
  - name
  - Universally Unique Identifier (UUID)
  - Company/Manufacturer information
  - Build information
- Base or Update
  - Full vs incremental update
- Version
  - backward_compatibility
- IU type identity elements
  - UUID
  - Version
- Multiple instances allowed
Requirements (expression of a dependency)

- A requirement is declared to be met by one or more *alternatives* (logical “OR”)
  - At least one alternative must be satisfied
  - Multiple non-exclusive alternatives should indicate a *priority*
  - *Example*: a requirement could be to have either DB2 or MSSQL installed
  - Requirements can be declared in single-target IUs (SIU/CIU) and topology targets

- An alternative combines one or more elementary *checks* (logical “AND”)
  - check definition may be elsewhere (normally in the checks section of the IU) or inline
  - The boolean result of an alternative is the boolean .AND. of all the referenced or inline checks
  - A check can be computed in the alternative with the .NOT. (testValue="false")
Checks (testing an environment condition)

- **Capacity** of the hosting environment. This specifies a property of the hosting environment, such as processor speed, and some minimum or maximum value.

- **Consumption** of resources allocated on the hosting environment. This specifies resource, such as diskspace, that will be consumed by the installation. Consumption requirements are cumulative across installable units.

- **Property** check. This compares the value of a named property exposed by the hosting environment against a specified value or pattern.

- **Version** of a target resource. This is used to check the value of a version property against a specified interval.

- **Software** check. This specifies the check of a software resource, identified by name and version range. The resource may not have an associated IU definition.

- **IU** (Installable Unit) check. This is used to determine if a given IU is installed.

- **Relationship** check. It specifies a relationship that must exist between two topology targets.

- **Custom** checks. These specify the execution of a user defined command.
IU Variables

- Variables can be defined at any IU level
- Variable types
  - `parameter`
    - May have default
    - Overridable (e.g. via a response file)
  - `derivedVariable`
    - Conditioned variable expressions
  - `queryProperty`
    - Value from topology target
  - `queryIUDiscriminant`
    - IU instance identifier (i.e. install-location)
  - `resolvedTargetList`
    - List of target instances for a logical target
  - `inheritedVariable`
    - To get the persisted value of a variable from an existing instance being updated
Variable expressions and conditions

- **Variable Expression**
  - Symbolic reference to one or more variables

- **Boolean variable expressions are used to condition the following**
  - **Installable units within the IUDD**
    - If “false”, the IU is ignored
      (selection based on environmental condition vs user selection)
  - **Sets of artifacts associated to a SIU**
    - E.g. to select the artifact set suitable for a given target instance
  - **Initialization of a derived variable (multiple conditioned expressions)**
IU life cycle – CM operations and artifacts

- **Change Management Operations**
  - Create
  - InitialConfig
  - Update
  - Migrate
  - Delete
  - VerifyIU
  - Undo

- **IU Artifacts**
  - Most operations have an associated artifact
    - Install artifact [for Create & Update]
    - InitConfig/Migrate artifacts
    - Delete artifact
Logical view of the change management process

- One or more hosting environments are the targets of the software being installed.

- The user provides input, in this process, either interactively or via a response file.

- That input drives the activity of a software installer program that interacts with the hosting environments and the IU registry.
Questions

Installable Unit Deployment Descriptor

- ACS-WG -

(acs-wg@ggf.org)
Summary

- Requirements for IUDD and AAF are very similar
- Leverage a broader standard like IUDD so configuration problem is addressed at many levels of granularity with same data
- Candidate standards such as IUDD and provisioning implementation efforts such as NaReGI and others provide foundation.
- Encourage vendors of install products to participate in ACS-WG.