Technical white paper

# HP CloudSystem Matrix Federation using CSA

Integrating CSA and MOE for maximum Cloud agility

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# Introduction

HP Cloud strategy, HP Converged Cloud, was designed to provide solutions in 3 key areas:

- Public Cloud with HP Cloud Services (**www.hpcloud.com**)
- Managed Cloud
- Private Clouds

This strategy allows HP to be uniquely positioned today, as the sole provider of Hybrid Cloud solutions.

The key product in the Private Cloud space, is called HP Cloud System, and is available in 3 flavors:

- HP CloudSystem Matrix, a turnkey solution including software and hardware to build a Private Cloud in a short amount of time using components of the HP Converged Infrastructure such as HP BladeSystem, HP VirtualConnect, HP 3PAR storage and the Matrix Operating Environment (MOE) software stack to control the entire package
- HP CloudSystem Enterprise which includes several software packages to what HP CloudSystem Matrix already offers, such as HP Cloud Service Automation (CSA), HP Server Automation (SA), HP SiteScope, HP uCMDB
- HP CloudSystem Service Provider which adds to these two packages a Telco oriented aggregation layer

# HP CloudSystem Matrix

HP CloudSystem Matrix includes a set of hardware components and a software stack often referenced as MOE for Matrix Operating Environment. On its own MOE handle enough functionality to build an IT centric private Cloud. MOE is particularly well suited for what is often referred as IaaS (Infrastructure as a Service). The most important components of the solutions are:

- A Service Template designer (a.k.a. HPIO Designer) which allows a solution architect to build an infrastructure service template, by assembling compute resources (virtual, physical, both) from different virtualization vendors (Microsoft, VMware, HP, RedHat), storage resources and network resources.
- An administrative console (which plugs in HP Systems Insight Manager) to control the pools of compute, storage, and network resources, and the private Cloud roles and responsibility, in a multi-tenant way. This is also the place where Service Templates are assigned to organization (or tenants), and made available in their service catalog.
- One or more tenant administrative console, in the case where multi-tenant is configured, then MOE handle some level of delegation to organization administrator using a dedicated portal.
- One or more tenant user portal, where end users of the cloud (line of business managers, IT managers) can login and order, automatically provisioned services from their catalog.
- A workflow engine called HP Operations Orchestration (HP OO), which allows a solution architect to extend the behavior of MOE by graphical programs (workflows), added to a service template and automatically (headless) executed by MOE during a provisioning.

# HP Cloud Service Automation (CSA)

HP CSA is a product that is available as part of the HP CloudSystem Enterprise Edition. It's a framework which allows to build more complex Cloud solution, where MOE is considered a resource provider, side by side with other resource providers such as VMware Vcenter or OpenStack. While the two product share a fair amount of features (provision VM on a VMware or on an OpenStack environment), we will focus here, on a use case where it makes good sense to combine the power of both solutions to offer an even more complete solution to our customers. The use case is quite simple, although quite common in our Matrix customer's environment. If CSA can have a MOE as a compute resource provider, it can also have several of them configured. So why not use CSA to federate multiple isolated MOE platforms. This is exactly what this whitepaper is all about.

# A word about our test environment

Let's quickly explain the environment used to setup this experiment. We used an HP internal platform called CISS (Converged Infrastructure Solution Showcase). This platform is available on the internal HP network and consist in 3 identical (replicated) MOE platforms, located in three datacenters around the world. These platforms are used for Pre-sales demonstrations throughout the year via our **Solutions Demo Portal**. We have one copy of this MOE environment in Houston, TX, one in Grenoble, France, and one in Singapore. Each of these is configured the same way, so the same organizations, templates, images, user, password are available at each location. In each of them we created a fictitious company called SeeHigh Records, with multiple organizations mapped to different music styles (soul, metal, rock, pop …). A separated organization was create for Premium Partners, to allow selected partners to benefit from SeeHigh Records IT Services. A central CSA was added to provide the federation of the 3 CISS platforms, and allows those premium partners to order IT services and request hosting anywhere in the 3 datacenters that SeeHigh Records owns.
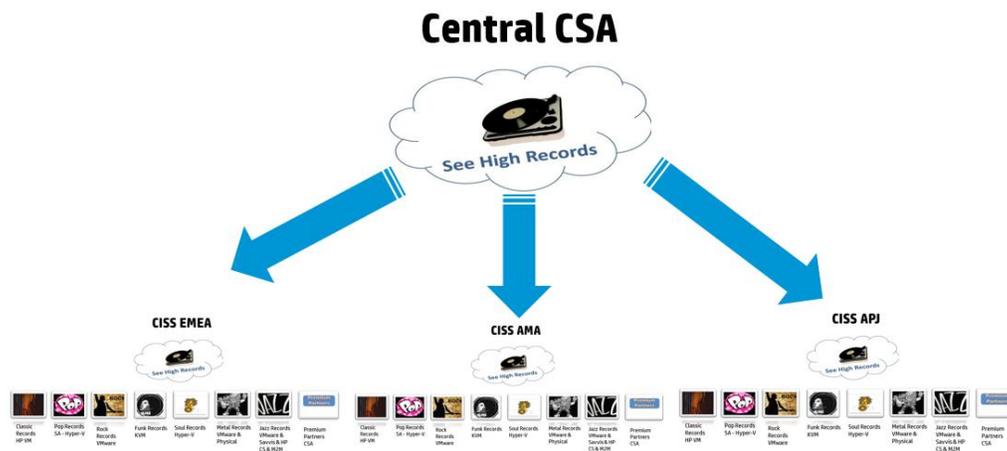


The central CSA system is where all configuration steps take place. It's important to realize that in this architecture, the MOE platforms were already in production and are not changed in any ways.

# Setting up MOE Providers in CSA

Let's first focus on what has to be done to configure Compute Providers in CSA. In our case we will set up 3 MOE Compute Providers, one for each region. To achieve this we will use the administrative portal of CSA



From there we will configure the connections to the 3 Resources Management Providers. One for each MOE.
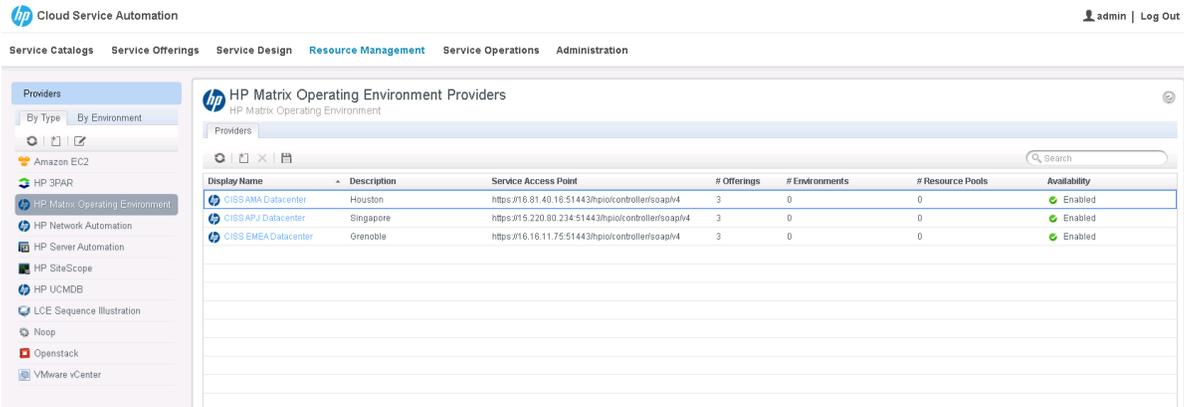
For each of these connections we need to set:

| Connection Name | Access Point | Property Name | Property Value |
|---|---|---|---|
| CISS AMA Datacenter | http://<iP-AMA>:51443/hpio/controller/soap/v4 | MOE_REGION | AMA |
| CISS EMEA Datacenter | http://<iP-EMEA>:51443/hpio/controller/soap/v4 | MOE_REGION | EMEA |
| CISS APJ Datacenter | http://<iP-APJ>:51443/hpio/controller/soap/v4 | MOE_REGION | APJ |

We also need to set the credential (User ID/password) used to control each MOE (which is the same in our case but doesn't have to be). Make sure you use an administrative account there. Because when using a multi-tenant design, CSA will call the MOE API, with that user, impersonating the CSA logged in user. And when using a non multi-tenant design CSA calls the MOE API with this provided user.



Use the Properties tab to add the MOE_REGION property on each of the providers:
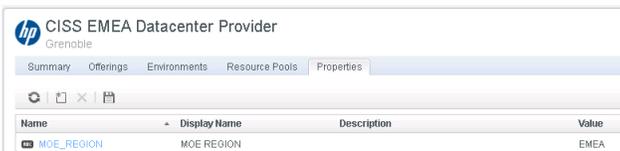


This property will be used to select the right provider based on the user selected region at subscription (ordering) time.

The last configuration required on the providers, is to assign the MOE_SCL_MT which will be used as the source of our Service Offering to all three providers as shown below:

# Creating a new Service Design in CSA

Now we need to create a new Service Offering, and for this we will duplicate an existing one called MOE_SCL_MT. MT stands for Multi-Tenant, because in our implementation the MOE platform have been setup with multiple organizations. If you have no organization you can duplicate the MOE_SCL design instead (don't forget to assign it to MOE Providers as we just did in the previous step)



Edit the newly duplicated Service Design and set a new name to it. For example A New Service:



Open the Design view of the service
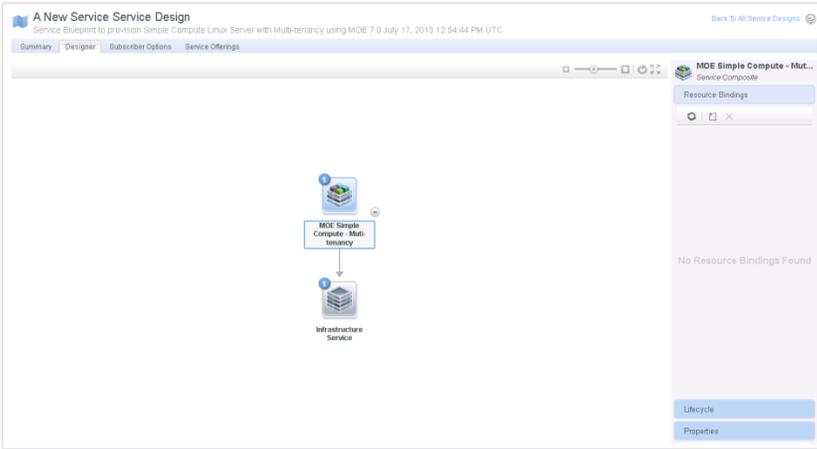
Select the Infrastructure Service that compose our service and on the right side, select the Properties section to visualize the properties associated.
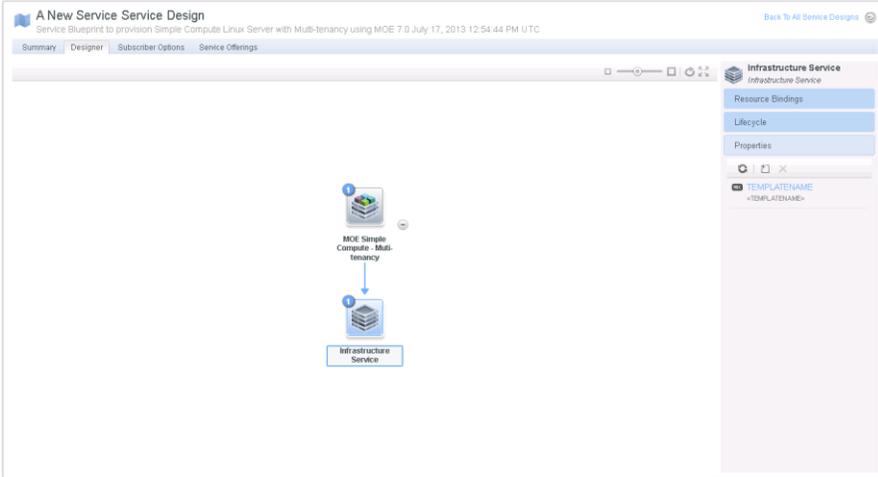


We can see that the only property required by such a design is a TEMPLATENAME. Let's edit this property and assign a value to it. This value is the name of the MOE Template that we would like to provision. In our case it's called: **Bronze Hyper-V Wordpress Service (Windows) CSA Template**
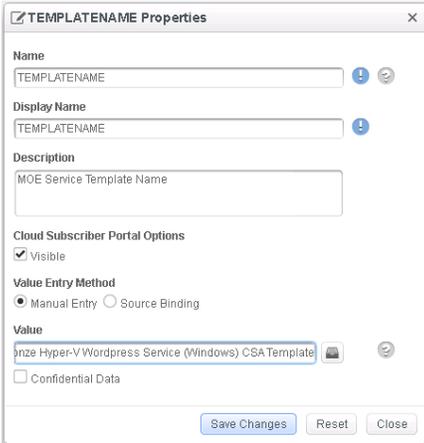


In addition to this we will create a new property to hold the user selected region at ordering time. It's going to be typed String:
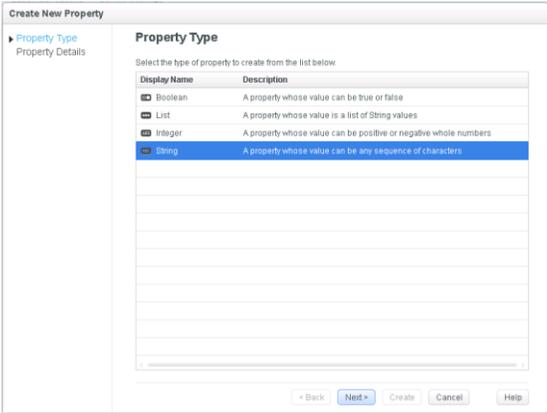
Let's call this new property: SELECTED_REGION. No need to assign a value as this will be done via subscription options
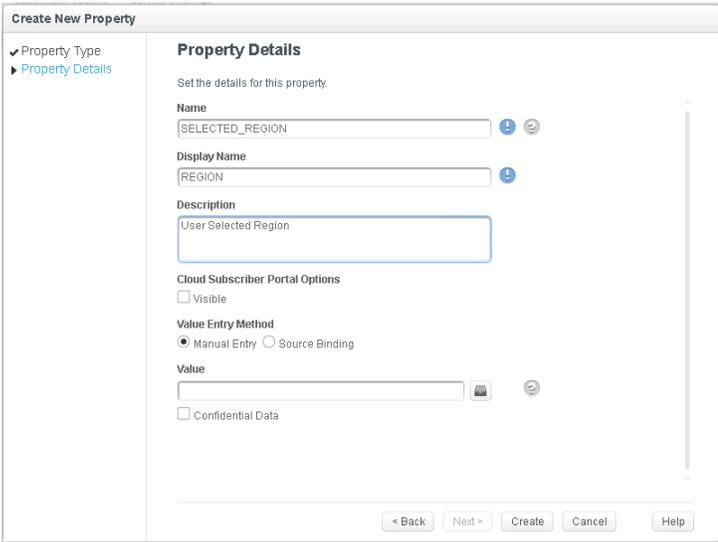


After this we shall have two properties for this design, TEMPLATE_NAME and SELECTED_REGION.
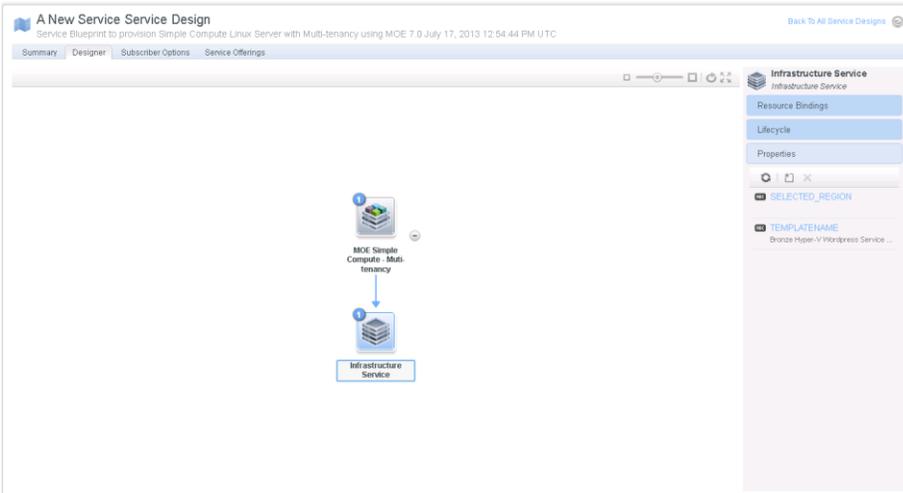


Let's now pick the Subscriber Options tab. This is where we can add additional options, which will be prompted to the user at ordering time in the consumer portal of CSA.
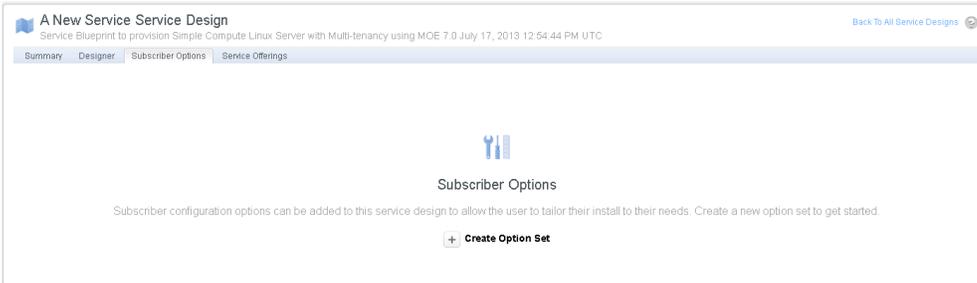
Select to create a new Option Set, and call it Select Region:
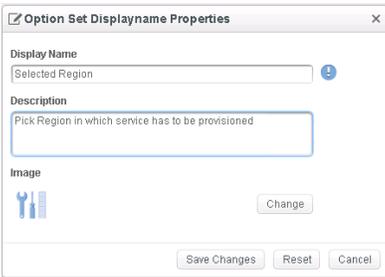


Add three options to this Option Set (one for each region):
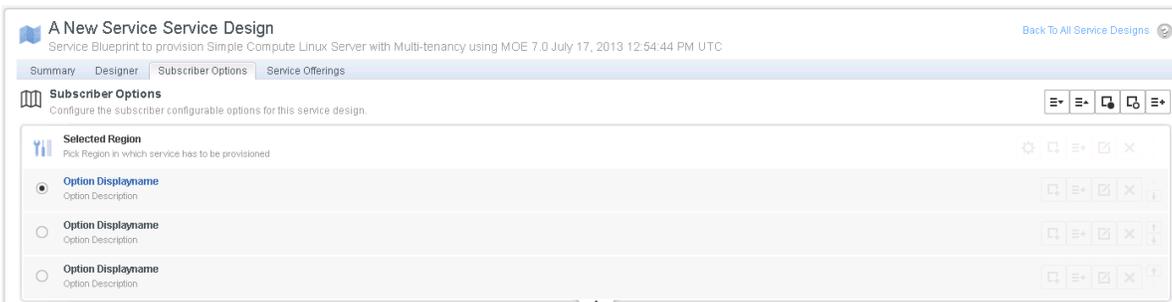


Then edit each Option to give it a name (EMEA, AMA or APJ)
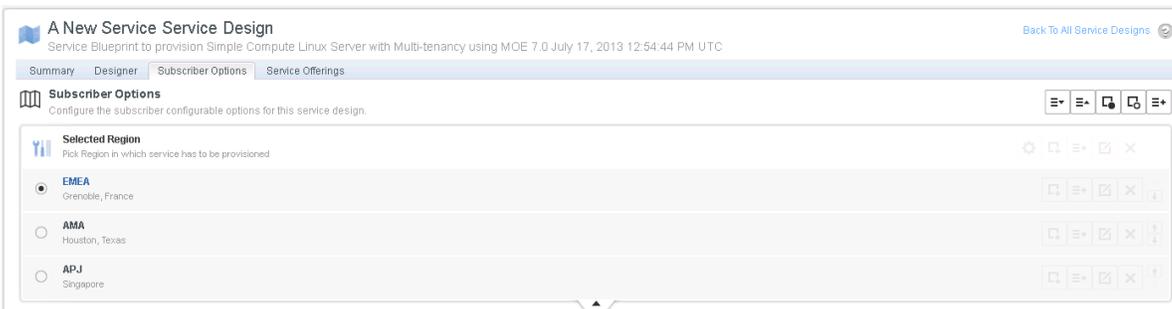


Then on each Option, add an Option Property, of type String
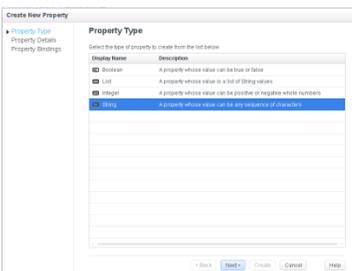
Call this property SELECTED_REGION and assign the right value for each Option (set the value to EMEA for Option EMEA, to AMA for Option AMA and APJ for Option APJ).
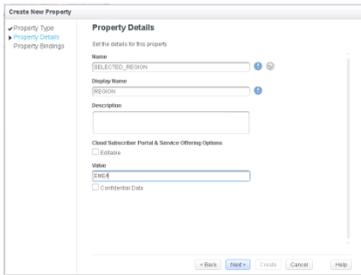


Finally add a binding to this property, so that it sets automatically the value of our Service Design property SELECTED_REGION:
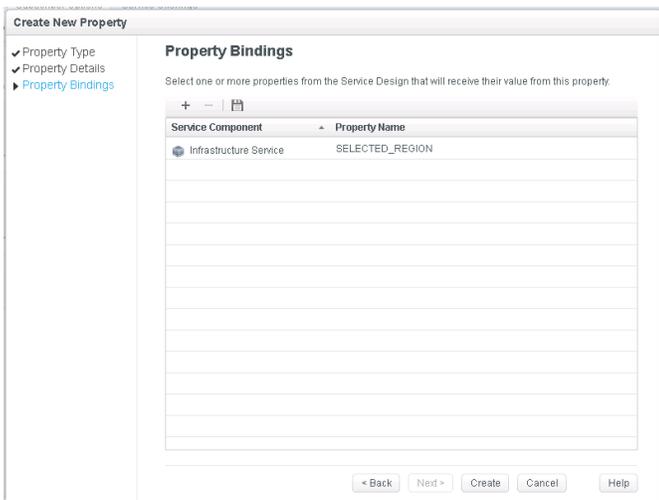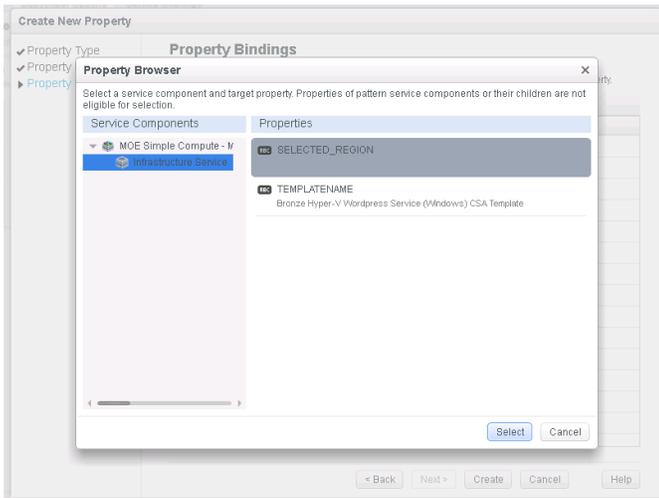




Note that you can do this in a single step by using the "Create a property on all option within this set" button.

The effect of this, will be that each Option in the Option Set (shown as a radio button) will set a different value to the SELECTED_REGION property as user pick a choice. Don't for get to save your changes at this step:



# Building a custom provider selection process in CSA

Now the last tricky part of the process is to create a custom provider selection algorithm, so that when a user picks a region, the right datacenter is used to provision. Remember that we have tagged each provider with a property called MOE_REGION, and that each design will have a property representing the user selected region called SELECTED_REGION. We will need to match those two properties, and the way this is done in HP CSA, is by using a HP OO workflow.

## Creating a new provider selection workflow

So let's start Operations Orchestration Studio, the flow authoring tool of HP OO. There we can browse the flow Library and locate the place where all the CSA content is located. For example in CSA->3.0->Providers->Matrix Operating Environment->HP IO Customer Provider Selection->Actions we can see a flow called User Organization based MOE Provider Selection, which we can use as a good starting point. So let's duplicate this flow and call our new flow: **MOE Selection based on Region**

And start editing this flow.
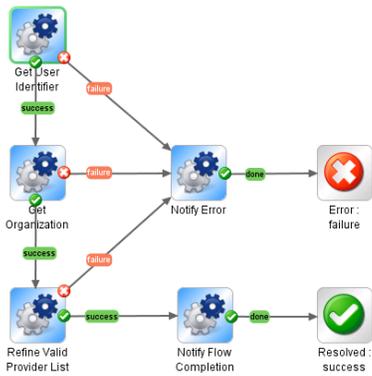


First let's delete the second step, **Get Organization Details**, which we don't need:
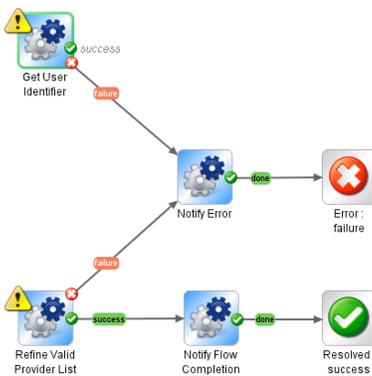


Then drag and drop a step called: Get Artifacts properties which you fill find in the library at**: Integrations->Hewlet Packard->Cloud Server Automation**. Now let's do a little plumbing: Connect the previous step success transition to it, and connect this step success transition to the next step. Connect the failure transition of the step to the Notify Error step, so it looks like this:
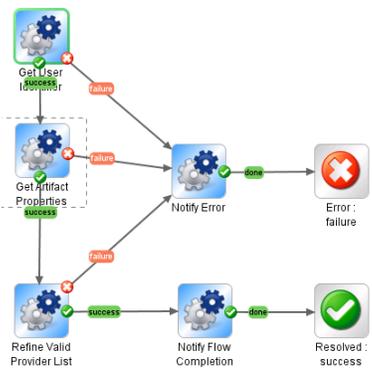


Let's new configure the details of our step but using the Step Inspector (double click on step). The property we need to retrieve from the object we are correctly servicing (called the Artifact) is called: SELECTED_REGION. So let's set this up as a constant value as shown below:
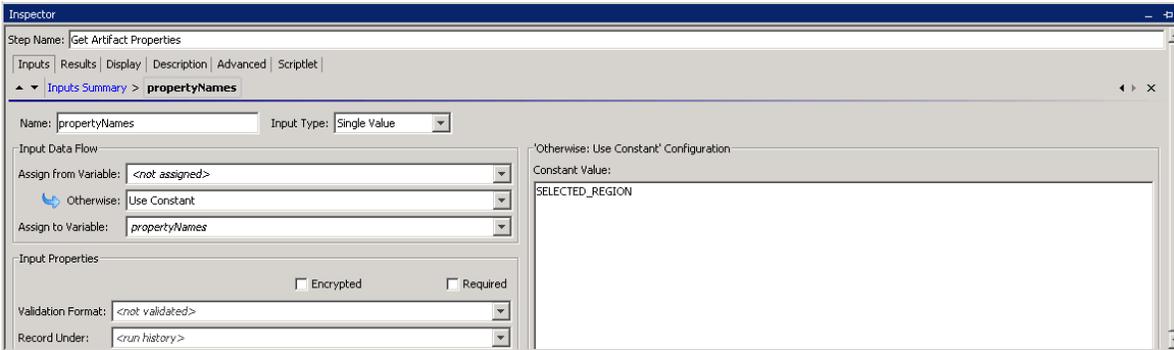
Then as a step result, add a **UserSelectedRegion** variable and apply a strip filter to only keep the value of the property, knowing that the call will return a string of the form: **SELECTED_REGION;value**
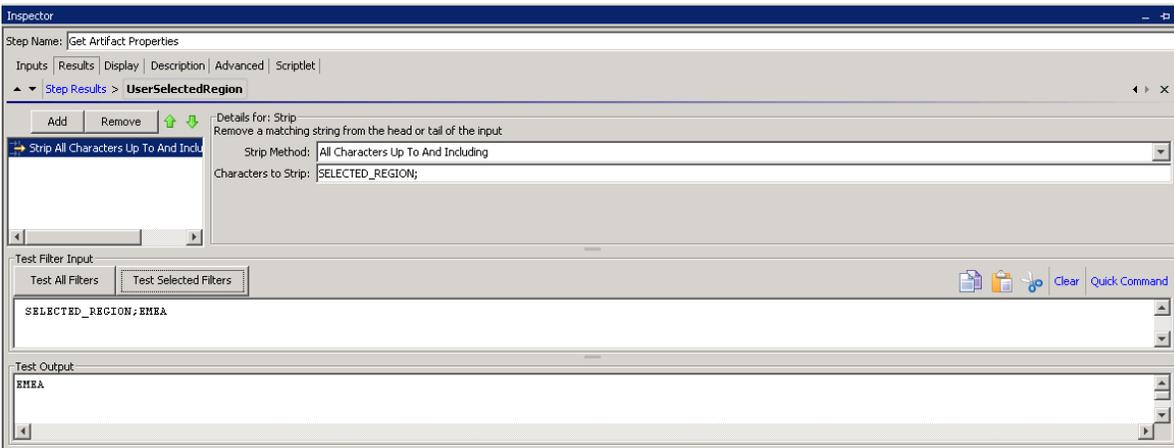


Now select the next step called **Refine Valid Provider List based on Property** and change the **propertyName** to be **MOE_REGION** (the property on the provider), and **propertyValue** to be the result of the previous step stored in variable **UserSelectedRegion** (the property selected by user in portal) which in OO is: **${UserSelectedRegion}**
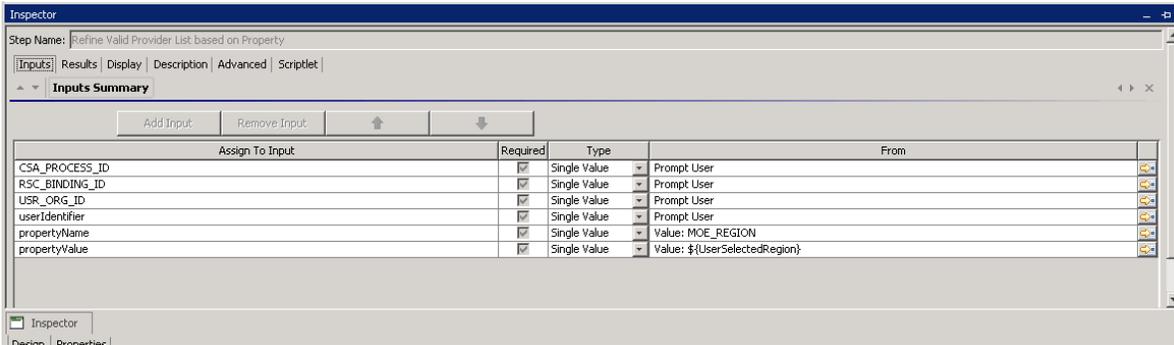


Save all changes and check the flow in.

# Registering the workflow to be used in CSA

The next step is a bit complicated, and unfortunate, but what it boils down to is that we have to tell CSA, about our new workflow, before CSA can actually make use of it.

For this you have to register it and this is done by tools located in: **<CSA Install dir>\tools\ProcessDefinitionTool**

If you created the new flow in the location described in this document, you will only have to basically rerun the process definition tool that was run when CSA was installed, because the folder is already taken into account there. You can see this in the XML file that describes the content that needs to be exposed to CSA:

There is an example of command to validate the content:

**..\..\..\CSA\jre\bin\java.exe -Done-jar.class.path="ojdbc6.jar|orai18n.jar" -jar process-defn-tool.jar -d db.properties -i HPOOInput3.10.xml -v HPOOInput3.10.xml**

And an example of command to finally import the content:

**..\..\..\CSA\jre\bin\java.exe -Done-jar.class.path="ojdbc6.jar|orai18n.jar" -jar process-defn-tool.jar -d db.properties -i HPOOInput3.10.xml**

Both would have to be adapted to your CSA environment but at the end of the procedure the new flow is added to CSA, and the command will show the name of the newly added workflow.

## Adding the workflow in the Service Design

So let's now go back to our Service Design and make use of this custom procedure. Open the Designer view and locate the Resource Bindings section on the right side.
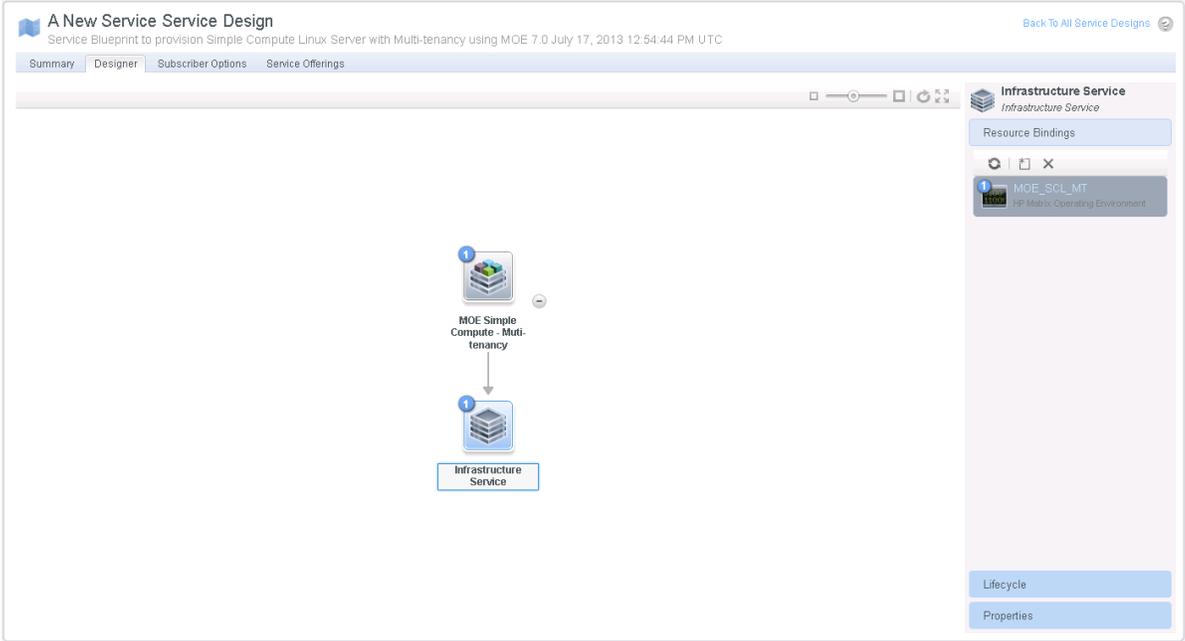


Select MOE_SCL_MT, and there select the Provider Selection tab. You can see that there is a two steps process to select a provider by default. Step 1 builds a list using an Internal CSA process engine procedure, and Step 2 Select Resource Provider using, again an internal CSA procedure.
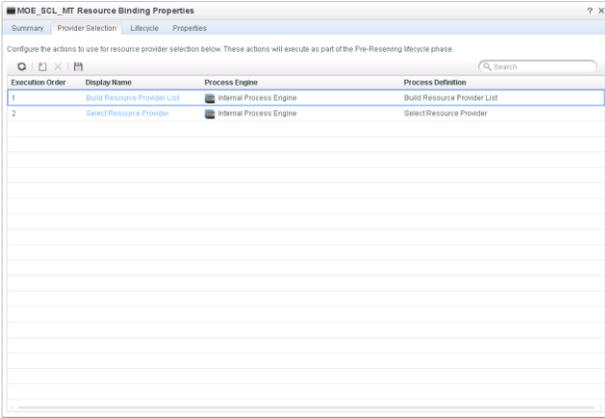
Let's change this a little and add a new step, select the HP Operations Orchestration, as this is how our step is implemented:
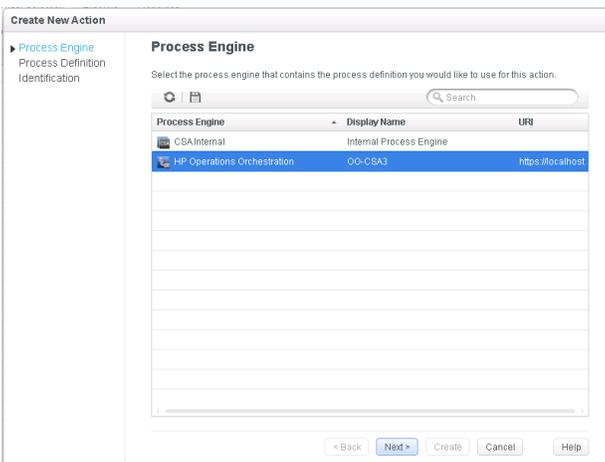


And in the long list of available flows, pick the one we've just created. You can type in **Region** in the search box to find it quickly.
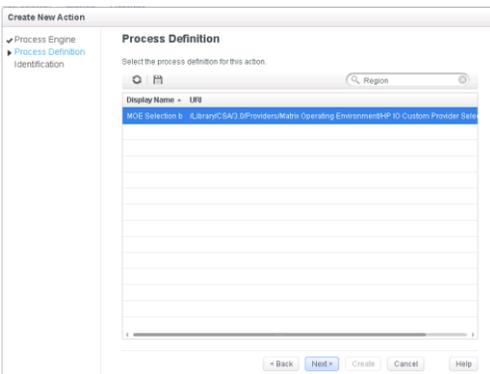


Set the execution order to 2 so the step execute in second:
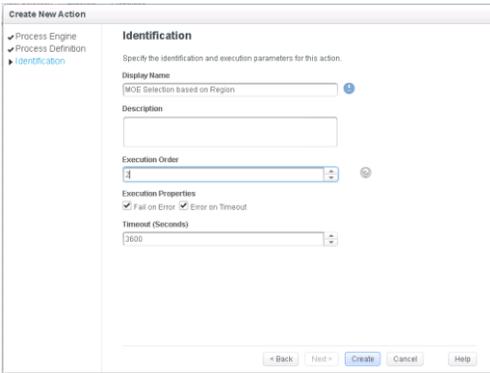
And modify the order so that Select Resource Provider is executed third
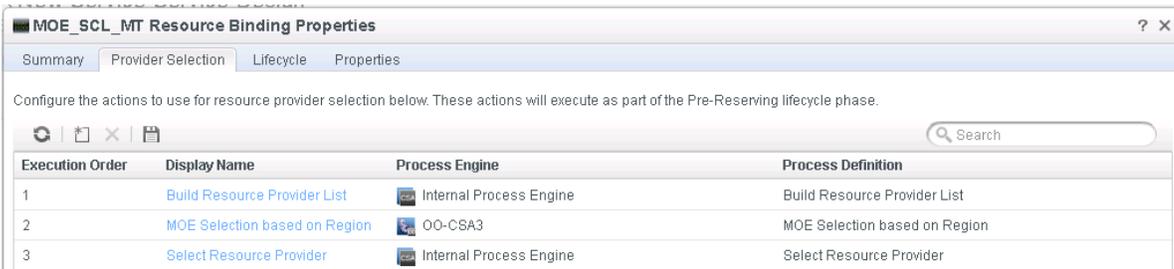


Open the Select Resource Provider step and set the Provider Property Name to **MOE_REGION**, as this is the name we have used on our 3 providers.



# Populating an end-user catalog in CSA

Now that we have built a Service Design, we need to create a Service Offering and then place this in whichever consumer catalog it will be offered to. So let's start with the Service Offering:
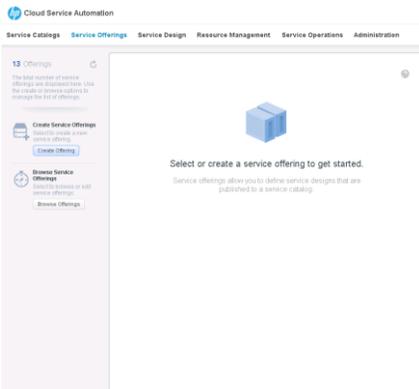
Create a new Service Offering called **A new service offering**



And select **A New Service** as a service design.



In the General Information page, customize it a little with a description, an icon and save those changes



In the Pricing page, let's assign cost information about the service. Not that there can be cost variation based on Service Options, in our case based on Selected Region. Save those changes.

Now we can make this Service Offering available in any consumer service catalog we wish. In our example we will publicize the offering in the default Consumer Catalog



We can add the new Offering



And place it in the right Category, in our case Infrastructure Services:

Ok configuration is terminated at this point. Let's pretend we are a user of the Consumer portal and see how this all works.

# Putting it all together

CSA users log in to their assigned portal (as you can have many portals for different population). In our case, we have this premiumuser, login in, and this premiumuser is also a user of the target MOE platforms, where we have created an organization called Premium Partners, a user called premiumuser and an organization administrator called premiumadmin.



## Premium Partners Portal

Welcome to SeeHigh Records IT Services

premiumuser | •••••••• | Log In

Remember me ☐

The first page show to the end user is the Dashboard where the status of the resources are shown. Let's pick the Catalog tab:

And there we can see the categories of Services available, and in the Infrastructure Services section, our newly created service: A new service offering. Select it:



Assign a name for this new subscription for example: MOE Service in AMA, and pick a Region using the radio button at the bottom. Then select Request Now to place the order in the queue:

Request can be monitored in the Requests tab:



And subscriptions in the Subscriptions tab (the new one might take a little time to show up, on top of the list)

If we take back our CSA Administrator hat, and go back to the CSA Admin Console, we can use the Service Operations tab which provide a great amount of details about requests in the queue. Pick the premiumuser to drill down:



We can see on top of the list the MOE Service in AMA that was ordered by premiumuser, as Pending, currently Deploying.



We can drill down even more and see the details. We can see the steps that have been already taken to select the right provider. Second from the bottom is our OO workflow which was successfully executed: Congratulations!



We can select the Resource Provider tab and view which one was picked, and confirm that the AMA CISS datacenter was selected automatically.

Last quick check is to login to our MOE backend, using the Premium Partners Admin portal in AMA:



And check the Request currently in progress on the MOE AMA platform. We can see that we have this Service Name with a numerical value (generated by CSA) being processed, from user premiumuser, and using the right template.



Agreed the automatically generated service name is not that intuitive, but this can be changed too, and will be the subject of another whitepaper. Stay tuned!

# Conclusion

Aggregating or federating several MOE platforms with a single HP CSA is one great example of integrating two powerful products to provide an even more powerful solution to our customers. Thanks to CSA great flexibility and programmability, and thanks to the MOE API, we can assemble such complex solution and a relatively short amount of time.

**For more information:**

HP CloudSystem Matrix:

hp.com/go/matrix

Programing Cloud System Matrix for Dummies:

dummies.com/go/hpcloudsystemmatrixfordummies

CloudSystem Developers Community Web site:

hp.com/go/csdevelopers

Other HP CloudSystem Matrix white papers:

hp.com/go/matrixoe/docs

Other HP CloudSystem Matrix use case examples:

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