knowledge17

WORK at LIGHTSPEED™

Cloud Delivery Using Service Now and Puppet

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servicenow

Agenda

- Intro
- Business Problem / Goals
- Solution review
  - VMWare / AWS Environments
  - Puppet
  - ServiceNow
- Lessons Learned

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Speaker Introduction



NAME: Brian Hanson

TITLE: Technical Architect

FUNCTION: Cloud Architecture

COMPANY: Humana

EXPERIENCE: 15 Years IT, 8 years Infrastructure & Datacenter Architecture focused

EXPERTISE: Virtualization, Cloud, Automation

ACHIEVEMENTS: Delivering self-service, automated delivery of infrastructure resources

CURRENT PROJECTS: Automation, Self-Service, Public cloud (AWS/Azure)

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My Company



NAME: Humana

INDUSTRY: Healthcare, Wellness

MARKET FOCUS: Provides health insurance, Medicare insurance, health & wellness, and pharmacy products

COMPANY'S PRIMARY PRODUCTS/SOLUTIONS: Health Insurance, Medical Insurance, Health & Wellness, Pharmacy products

COMPANY-WIDE INITIATIVES: ~50,000 employees, ~3,500 IT employees, ~14,000 servers

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Session Overview



Objectives

- Understand how an organization can leverage Puppet with ServiceNow Cloud Management to standardize delivery to VMWare and AWS EC2



What You Will Learn

- Understand the importance of configuration management in IaaS
- Learn how to structure Puppet for usage with ServiceNow
- Learn how to integrate Service Now with Puppet

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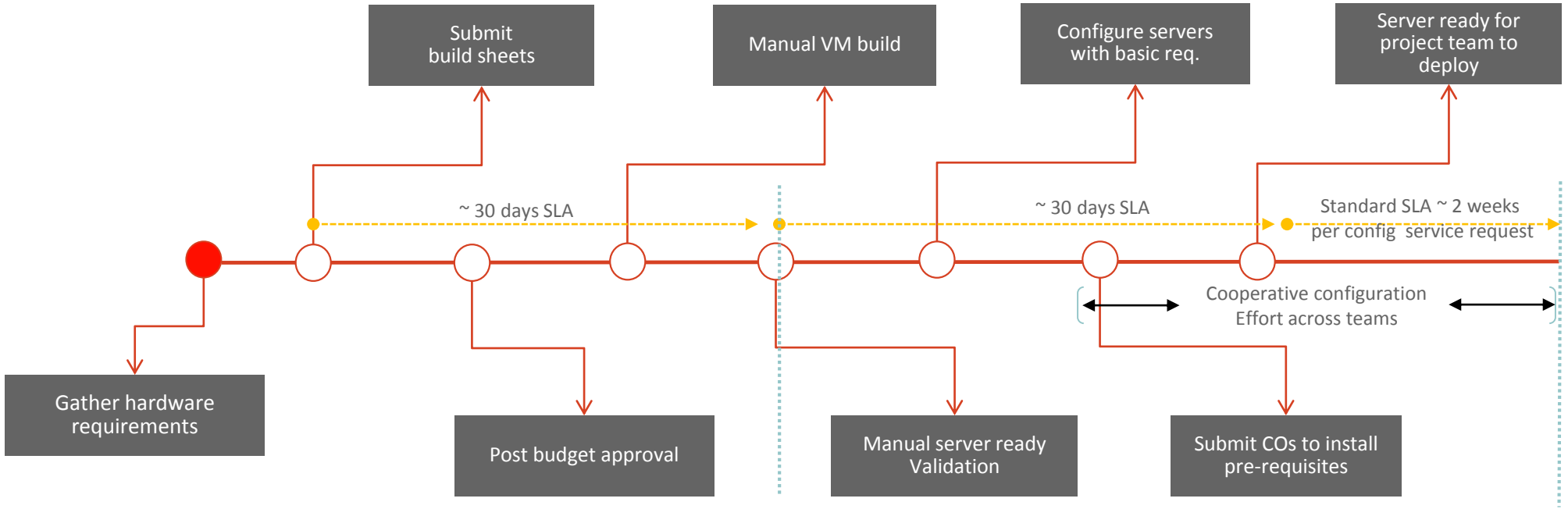
Current Challenges at Humana

- Demand is going up
  - Shifting from Waterfall projects to Agile development
- Demand is going outside of our primary datacenters
  - Different teams deliver to VMware vs. AWS
- Current VM request & build process is slow
  - Manual configuration error prone
  - Currently building 100-300 VMs per month manually
- No ability to spin up/down systems for testing or innovative work
  - Causing VM sprawl

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Problem Context

- 6-8 Week SLA to “get a VM” depending on configuration
- Multiple ticket handoffs between teams



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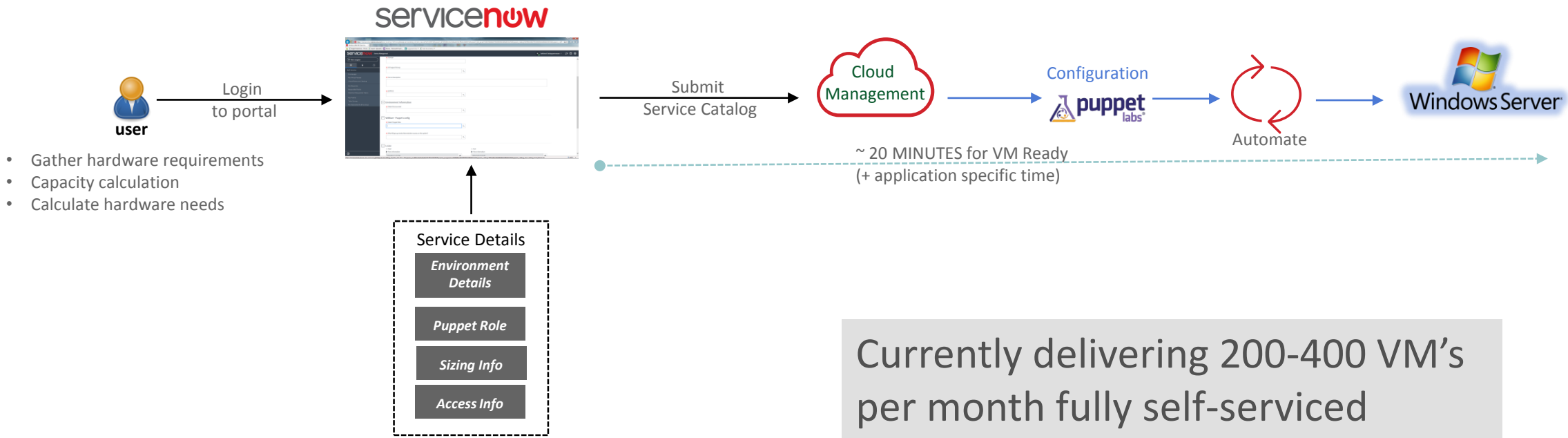
Solution Decision Points

- Do we try to fix the existing process?
- Use new infrastructure & technologies or use existing?
- Use existing Configuration tooling or build new?
- How do we transition from current process to new processes?
- Minimum viable or full feature rollout?
- Goals:
  - Enable solutions engineering teams to self-service infrastructure resources
  - Manage and report on resources across cloud environments

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Solution

- New offering available for use
- ServiceNow Catalog + ServiceNow Cloud Management+ Puppet + ServiceNow Orchestrator
  - Offering choice of where to deliver – VMWare or AWS



Currently delivering 200-400 VM's per month fully self-serviced

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Tooling Level Set

- Puppet
  - Desired state configuration tool
  - Necessary to automate delivery of systems at scale
- ServiceNow
  - Catalog
  - Orchestrator
  - Cloud Management Platform
  - CMDB

- Puppet Terminology
  - Role – A way to group together and refer to various configurations
  - Profile – A grouping of configuration options set in puppet code
  - Hiera – A key value pair used to provide data or variables in puppet code
  - Fact – Items discovered by puppet that are available as variables in puppet code

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VMWare & AWS Environment Background

Currently managing a subset of Humana's environments

AWS ENVIRONMENT:

- 8 AWS accounts, 16 VPC’s
  - One “shared” management account for management components (including puppet)
- 1 AWS provisioning rule
- Catalog items: Server 2012 R2, RHEL 7.1

VMWARE ENVIRONMENT:

- 2 datacenters, 3 vCenters, 6 clusters
- 1 VMWare provisioning rule
- Catalog Items: Server 2012 R2, RHEL 7.3

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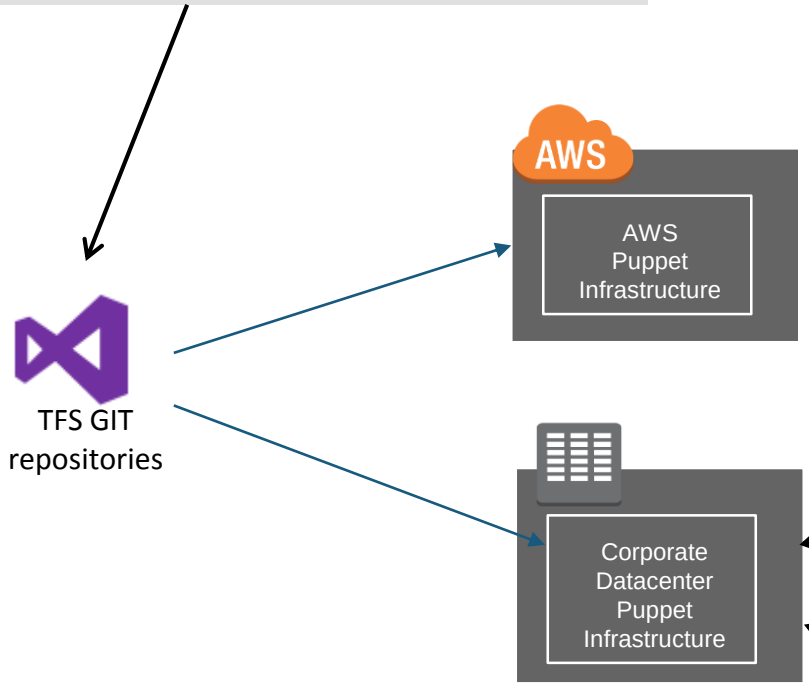
Puppet Infrastructure

- Puppet Enterprise 2016.5.2
- Two Puppet Enterprise Infrastructure Environments
- Single source code Repository in TFS 2017
  - Each branch represents a puppet “Environment”
- TFS Webhooks call to puppet code manager
  - Pull the current code sets from all branches
  - Creates or removes new environments in puppet

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Puppet Infrastructure

TFS Webhooks call to Puppet code manager



Puppet code manager pulls current code sets from TFS GIT repository

Puppet “environments” are created/deleted via Puppet code manager on each Puppet infrastructure based off of branch name

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Puppet Usage

- Use Roles & profiles
- All servers get one role
  - Specified via local fact on each server
  - Versioned for change management process
- Roles can contain other roles & profiles
  - Build profiles to be re-useable groupings of code
- We provide Base system roles and allow others to develop application specific code on top of our roles
  - Base roles contain required security, compliance, and audit items



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Puppet Roles / Profiles

```
# This defines a role class :
class role::tomcat_v1.5.19 (
        String $sn_os = 'linux',
        Array $sn_os_version = ['rhel6','rhel7'],
        String $sn_rolefilter = 'catalog filter',
) {
        contain ::role::base_linux_v1.0.5
        contain ::profile::java_v2.0.0
        contain ::profile::tomcat_v1.0.0
}
```

Role name assigned to server fact. We are versioning roles for change management

Variables are set and imported into ServiceNow to define role usage on catalog items

Roles can contain other roles and profiles. We require the base role to maintain compliance requirements

Profiles contain the resources and settings we are configuring

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Puppet Hiera

- Leverage Hiera
  - Hiera is a key-value pair of configuration options that can be used within puppet code
- Create reusable roles that reference Hiera configuration options
- Many ways to set Hiera values
  - Role, environment, node, application
- Reference an application Hiera by fact set on system

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Puppet Application Hiera (yaml\eyaml)

```
valid_roles: [role::windows_iisapp_1_0_0,role::windows_iisapp_1_0_1]
application_iis_sites:
www.mywebsite.com:
        dsc_name: www.mywebsite.com
        dsc_bindinginfo:
          - protocol: http
          port: 81
          - protocol: http
          port: 8082
        dsc_physicalpath: ‘c:\webapps\docs\www.mywebsite.com'
dsc_applicationpool: ‘mywebsiteapppool'
application_iis_application_pools:
mywebsiteapppool :
        dsc_name: mywebsiteapppool
        dsc_ensure: Present
        dsc_queuelength: '2000'
```

Roles hiera config file is available for

Settings used in puppet roles \ profiles. Code references a hiera lookup for the values in the puppet code

ServiceNow pulls all available hiera config files and valid roles from TFS GIT repository

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Puppet Code Development

- Publish Catalog items for Puppet developers
- Only allow puppet developers to override variables
  - Puppet infrastructure
  - Puppet environment (remember each TFS Branch = puppet environment)
- Speeds up process of developing and testing puppet code
- Maintains usage of Production code for all dev->production VM's for general users

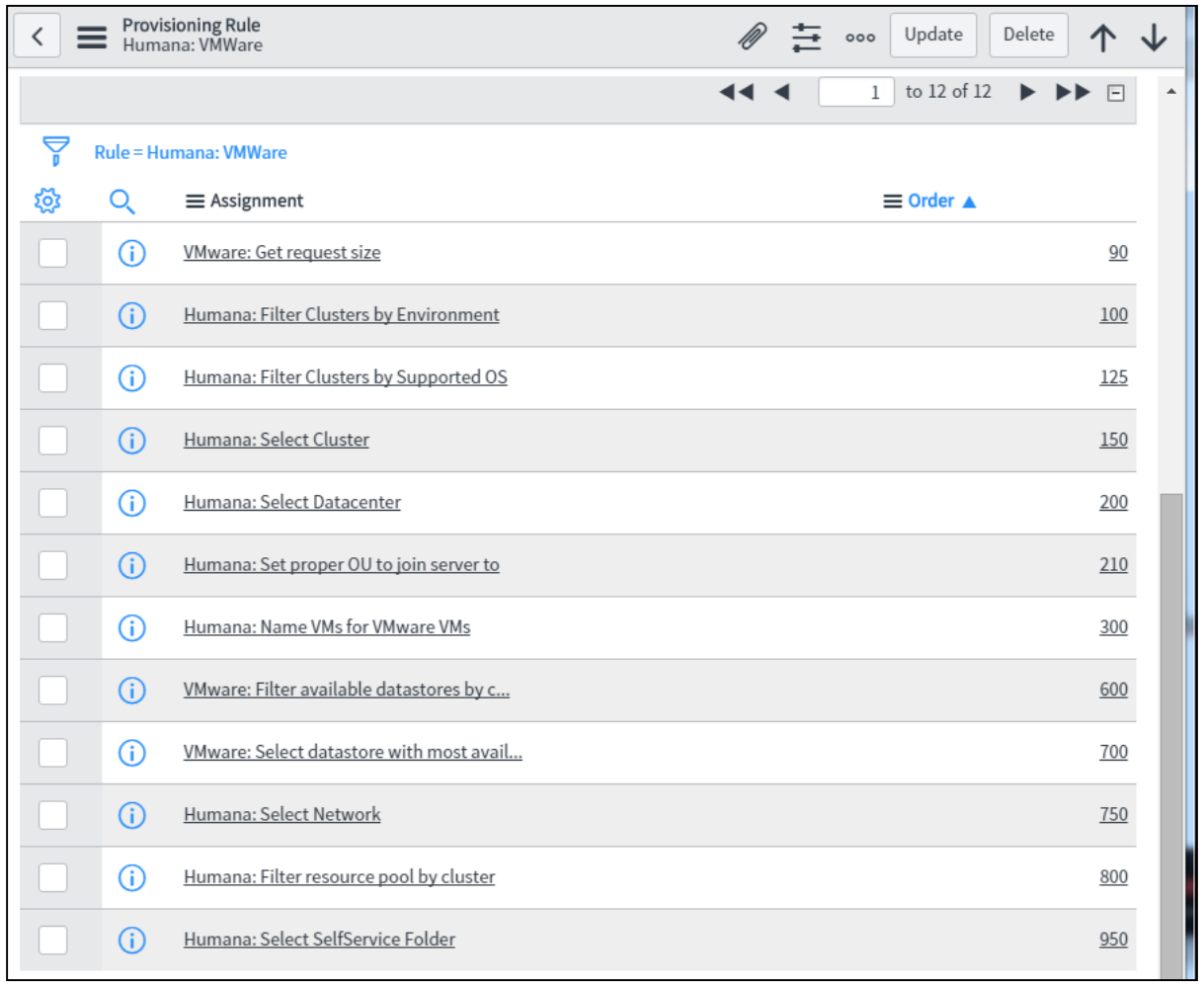
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ServiceNow Cloud Management

- Single provisioning rule for AWS
- Single provisioning rule for VMWare
- **USE TABLE LOOKUPS IN PROVISIONING RULES**
- Use ServiceNow provided integration points for calling orchestrations
  - For VMWare: VM_Extension_point.list
    - VMWareNetworkSelectionSetup -> infoblox
    - VMWareReleaseIPWFSelection -> infoblox
    - SetupPostProvisionWorkflow -> single post provisioning workflow used for vmware & AWS
  - For AWS: Cloud Management -> Cloud provider framework -> Cloud Management Providers
    - Amazon Web Services -> Cloud Management Provider Extension Point -> SetupPostProvisionWorkflow

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VMWare Provisioning Rule



Rules built to select proper cluster, datacenter, datastores, and networks.

Built in rules did not accommodate flexible resource selection with varying overprovisioning levels.

Overprovisioning %'s set on each cluster for CPU and RAM over commitment levels.

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AWS Provisioning Rule



Rules built to select proper Account, region, subnets, security groups, and key pairs.

Selections are related to environments that are related in the CMDB to specific AWS accounts, VPC's, Key pairs, and Security Groups.

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ServiceNow Integrations with Puppet

- Leverage the CMDB – this is what differentiates ServiceNow from other Cloud management platforms
- Data pulled from TFS & Puppet and stored in CMDB tables
  - Puppet environment / Role / OS / Role Filters
  - Application Hiera Configurations
- Create orchestrations to set the facts used to identify the configurations of the system
  - Puppet Infrastructure
  - Puppet environment
  - Puppet role
  - Application Hiera configuration files
  - OU to join

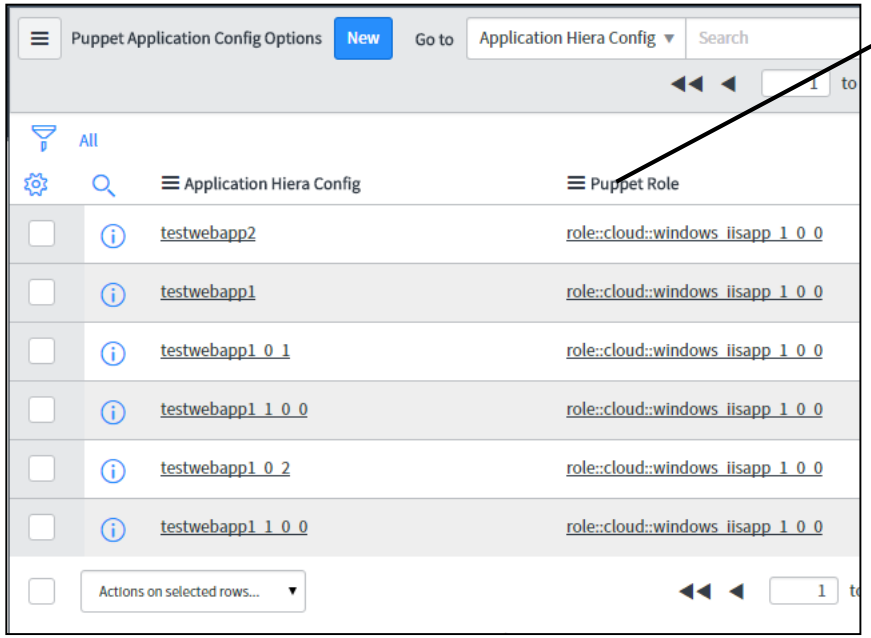
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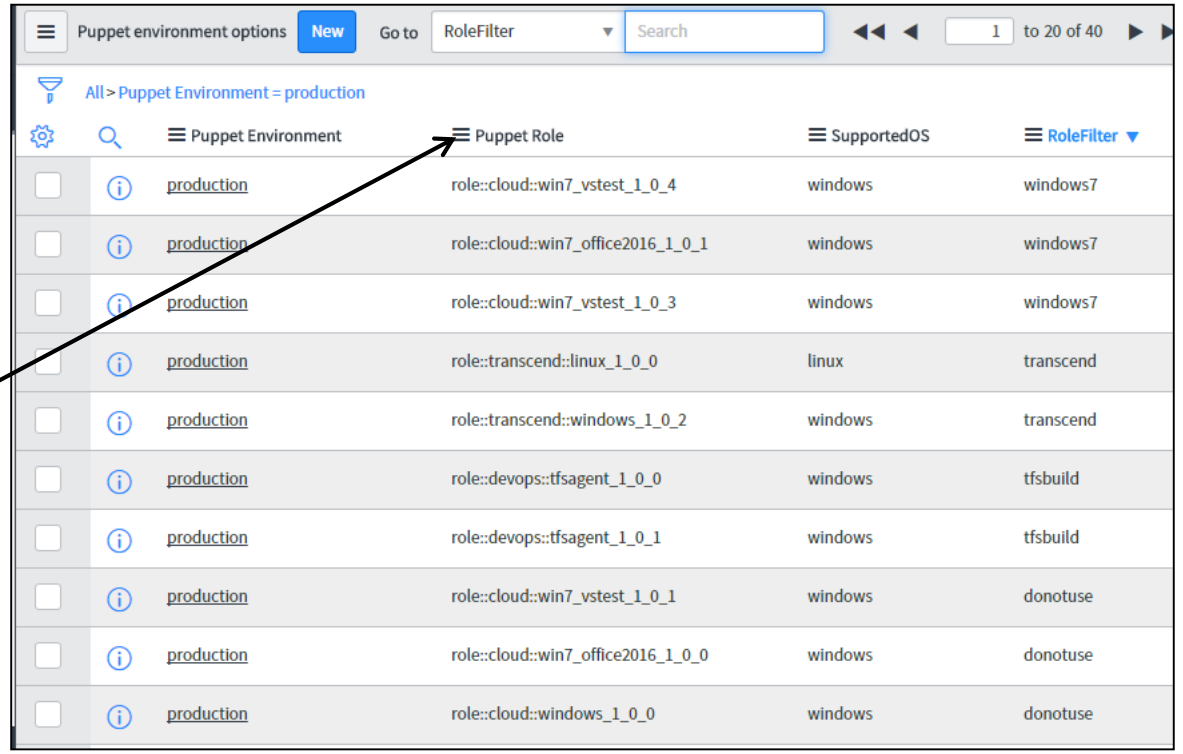
ServiceNow CMDB

- CMDB tables leveraged for relationships and variables
  - Custom tables
    - Puppet environment options
    - Application Hiera configuration files
    - Environment Identifier roles
      - Control permissions to environments based off of roles in ServiceNow
  - ServiceNow tables leveraged
    - Cmdb_ci_environment
      - Extended table to accommodate name, identifier, provider, naming scheme
    - Each environment is related to VMWare or AWS resources
  - Provisioning rules do lookups to the relationships in the tables

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ServiceNow CMDB Tables – Puppet Related





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ServiceNow CMDB Tables – Environment Related

Environments | New | Go to | Enviroment Identifier | Search | 1 to 17 of 17

All > Description != NULL

Name	Enviroment Identifier	Provider	Naming Scheme	Description
POC	Humana	AWS	T	Environment is used for proof-of-concept...
Development	Humana	AWS	D	Environment is used for development syst...
dmz-humitmgmt	Humana	AWS	T	Environment for delivering into the dmz ...
QA	Humana	AWS	Q	Environment is used for QA systems \ res...
humitmgmt	Humana	AWS	P	Environment used for provisioning to hum...
Production	Humana	AWS	P	Environment is use
Development	Interact	AWS	D	Environment is use
Production	Interact	AWS	P	Environment is use
POC	SelfService	VMware	T	Environment is use
Development	SelfService	VMware	D	Environment is use

Maps to a role for permissions to deploy to environment

Environment Identifier Roles | New | Go to | Environment | Search | 1 to 20 of 21

All

Environment	Enviroment Identifier	Provider	Role
clientintegration	TI	AWS	Transcend Insight Users
Development	SelfService	VMware	Humana Cloud Developer Users
Development	Humana	AWS	cloud_team
Development	Manual	Manual	Humana Manual Provisioning
devqa	TI	AWS	Transcend Insight Users
dmz-clientintegration	TI	AWS	cloud_team
dmz-humitmgmt	Humana	AWS	cloud_team

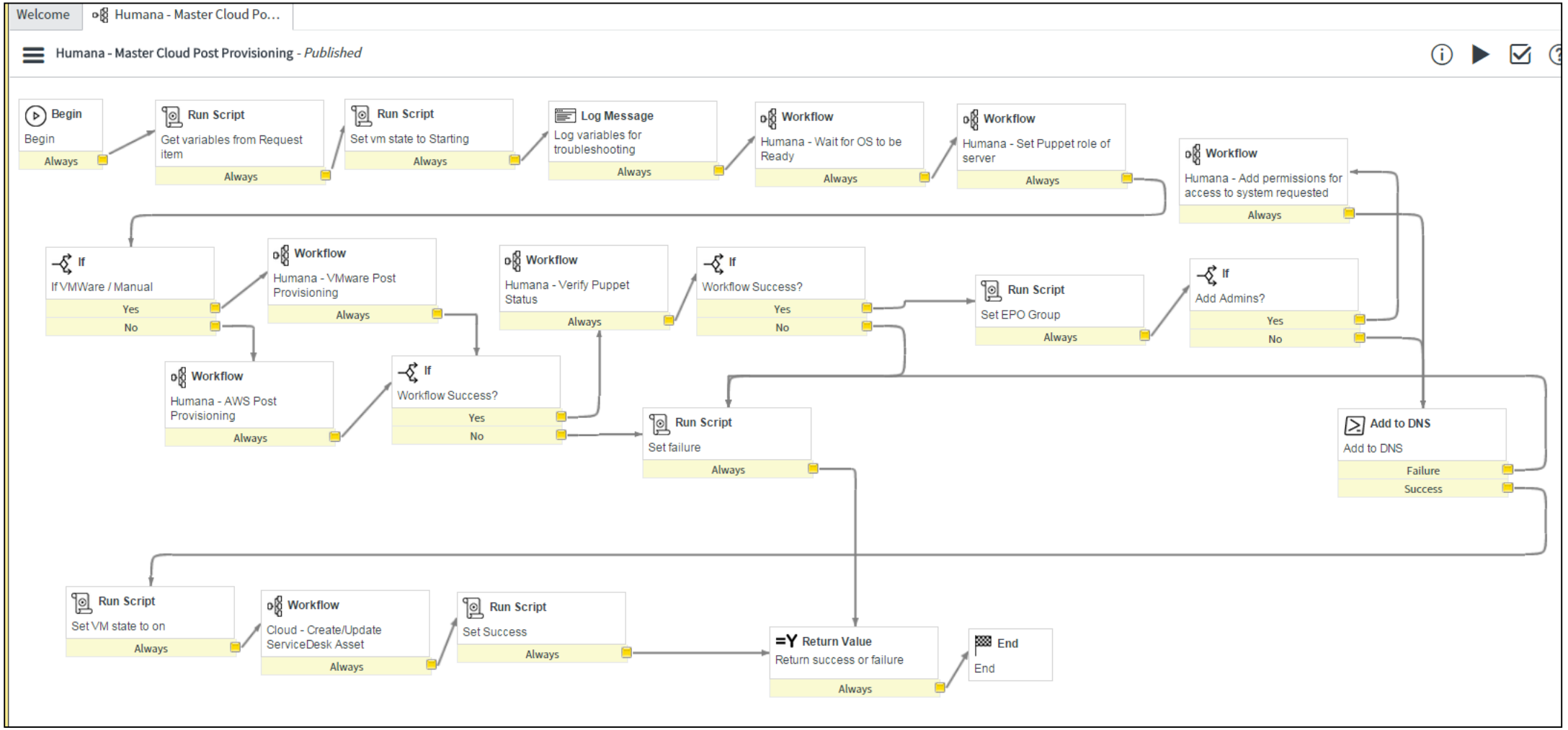
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ServiceNow Orchestrations

- Single Master Post provisioning orchestration used for VMWare and AWS
  - Sub workflows for specific tasks
- Single Master Termination orchestration used for VMware and AWS
- Recommendations:
  - Break down into sub workflows and activities
  - Build error checking / failure paths up front

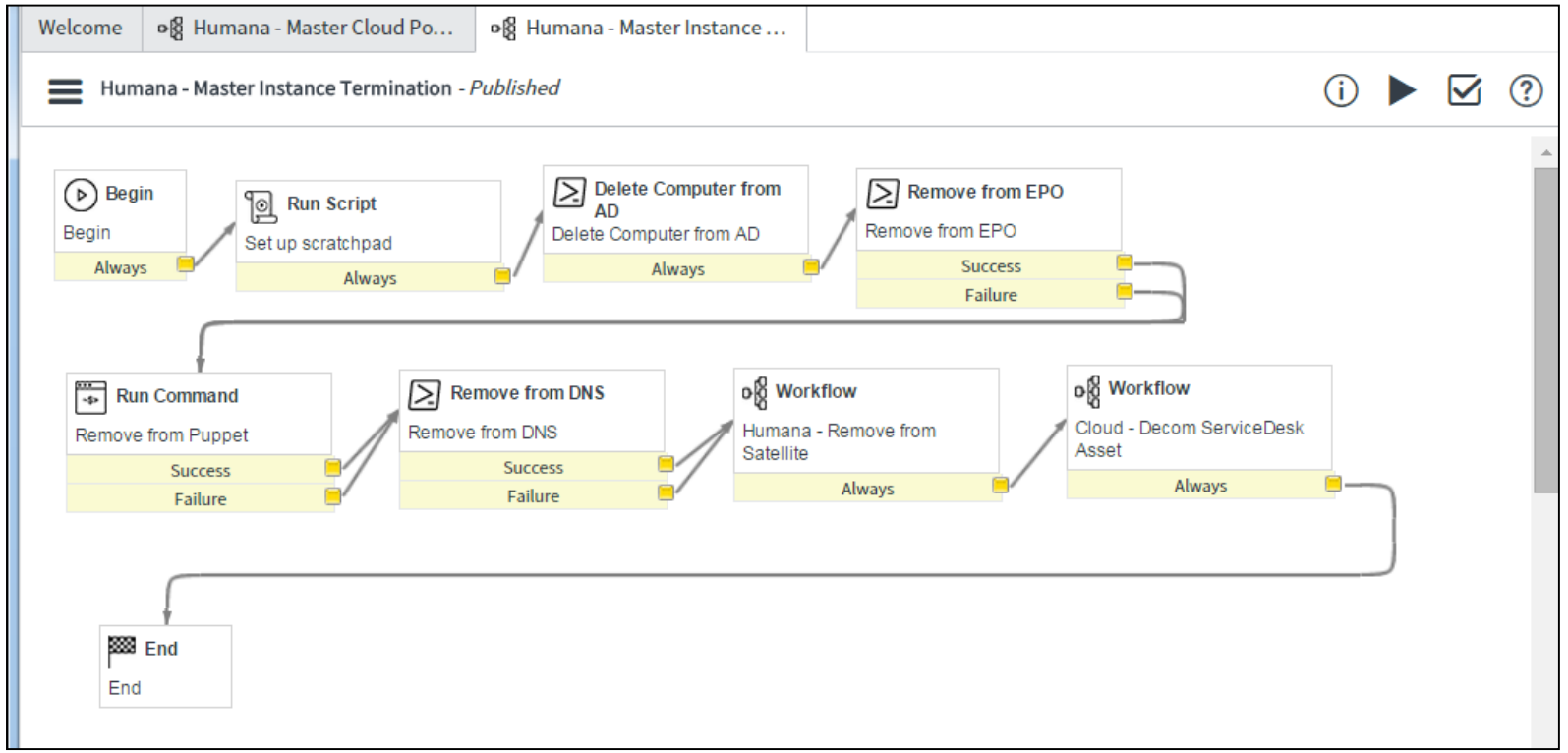
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ServiceNow Master Provisioning Orchestration



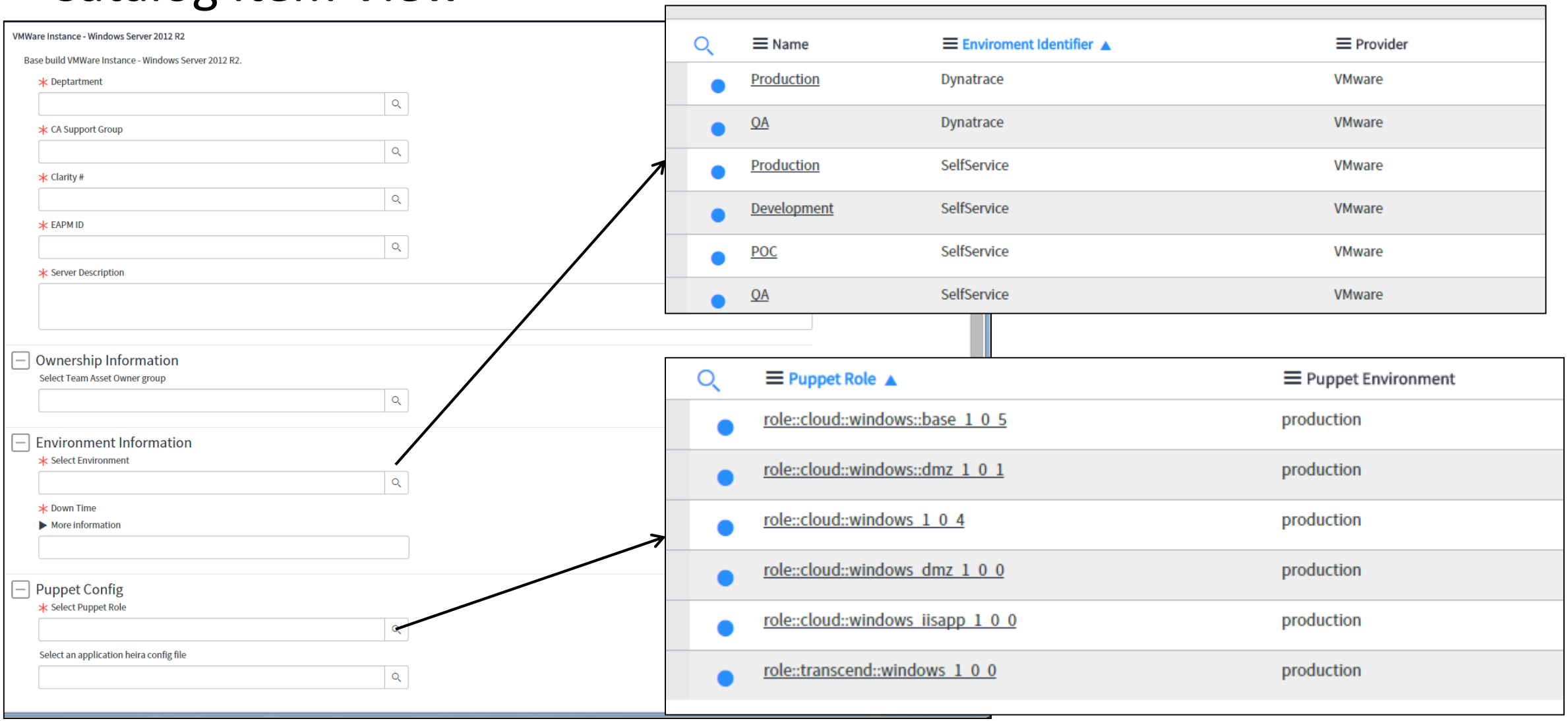
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ServiceNow Master Termination Orchestration



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Catalog Item View



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Value Outcomes

	BEFORE	AFTER
Consistent VM Configuration	No/Sometimes	Guaranteed
VM delivery time	6-8 Weeks	~20 min
Single process for requesting / delivering to VMWare & EC2	No	Yes
Configuration management	Unmanaged/Manual	Managed
Users enabled to self-service VM's	No	Yes

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Key Lessons Learned

1. Configuration management tool (puppet or equivalent) is a must have
   a) Build in a way that can easily be consumed and updated by orchestrations / catalog items
   b) Standardize as much as possible with configurations
2. Leverage the CMDB and table lookups rather than hard coding
   a) Use table lookups in orchestrations, script includes, and provisioning rules to reduce number of code changes needed.
3. Learning curve is fairly steep
   a) “Infrastructure as code” is a new concept for many Infrastructure resources
   b) Recommend training and consulting to get started

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Challenges

- Process and culture changes take time – Account for this in timelines
- Configuration Management tooling deficiencies
- Costing implications – internal “chargeback” for capital resources used for brief periods
- Capacity management – spin up/down is easy – how to plan for capacity?
- External process automation
  - Automate more of the development pipeline (DNS changes, load balancer, firewall, etc…)
  - This is a challenge when working across many silo’s within an organization

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Our Next Steps

- Service Portal
- Automate and self-service additional processes
- Additional configuration options – SQL servers, Gemfire, etc…
- Azure – IaaS & ARM templates
- AWS – Cloud formation Templates

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Thank You

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Q & A

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