Homing and Allocation Service (HAS)

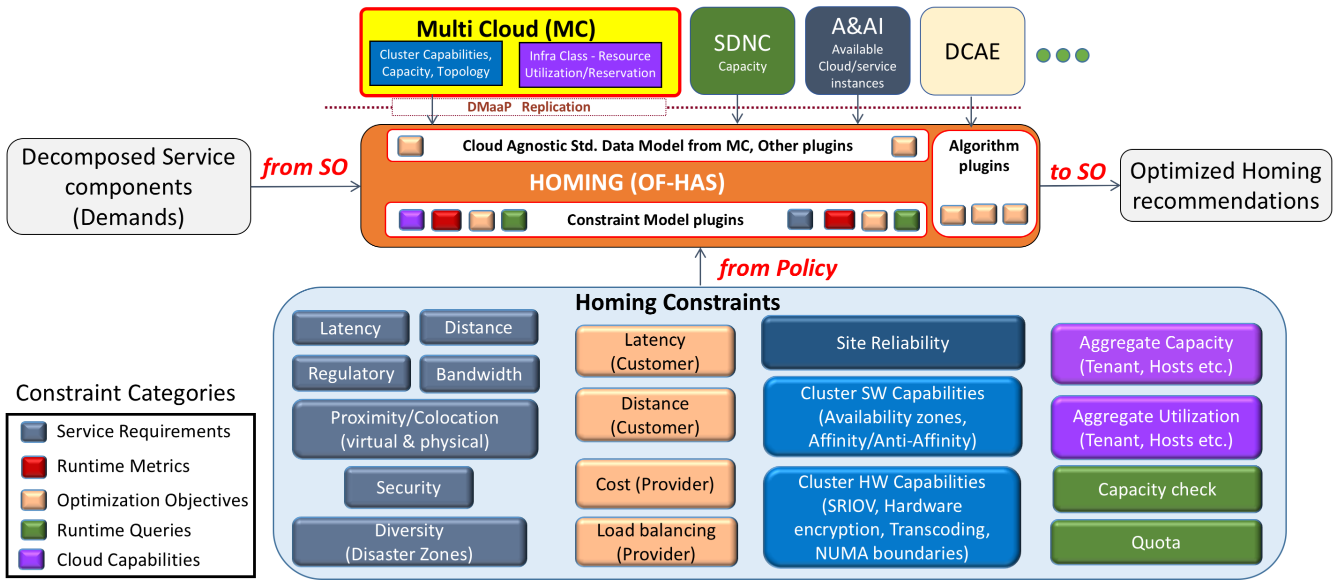
Introduction

OOF-HAS is an policy-driven placement optimizing service (or homing service) that allows ONAP to deploy services automatically across multiple sites and multiple clouds. It enables placement based on a wide variety of policy constraints including capacity, location, platform capabilities, and other service specific constraints.

HAS is a distributed resource broker that enables automated policy-driven optimized placement of services on a global heterogeneous platform using ONAP. Given a set of service components (based on SO decomposition flows) and requirements for placing these components (driven by policies), HAS finds optimal resources (cloud regions or existing service instances) to **home** these service components such that it meets all the service requirements. HAS is architected as an extensible homing service that can accommodate a growing set of homing objectives, policy constraints, data sources and placement algorithms. It is also service-agnostic by design and can easily onboard new services with minimal effort. Therefore, HAS naturally extends to a general policy-driven optimizing placement platform for wider range of services, e.g., DCAE micro-services, ECOMP control loops, server capacity, etc. Finally, HAS provides an traceable mechanism for what-if analysis which is critical for ease of understanding a homing recommendation and resolving infeasibility scenarios.

HAS in Service Instantiation workflows

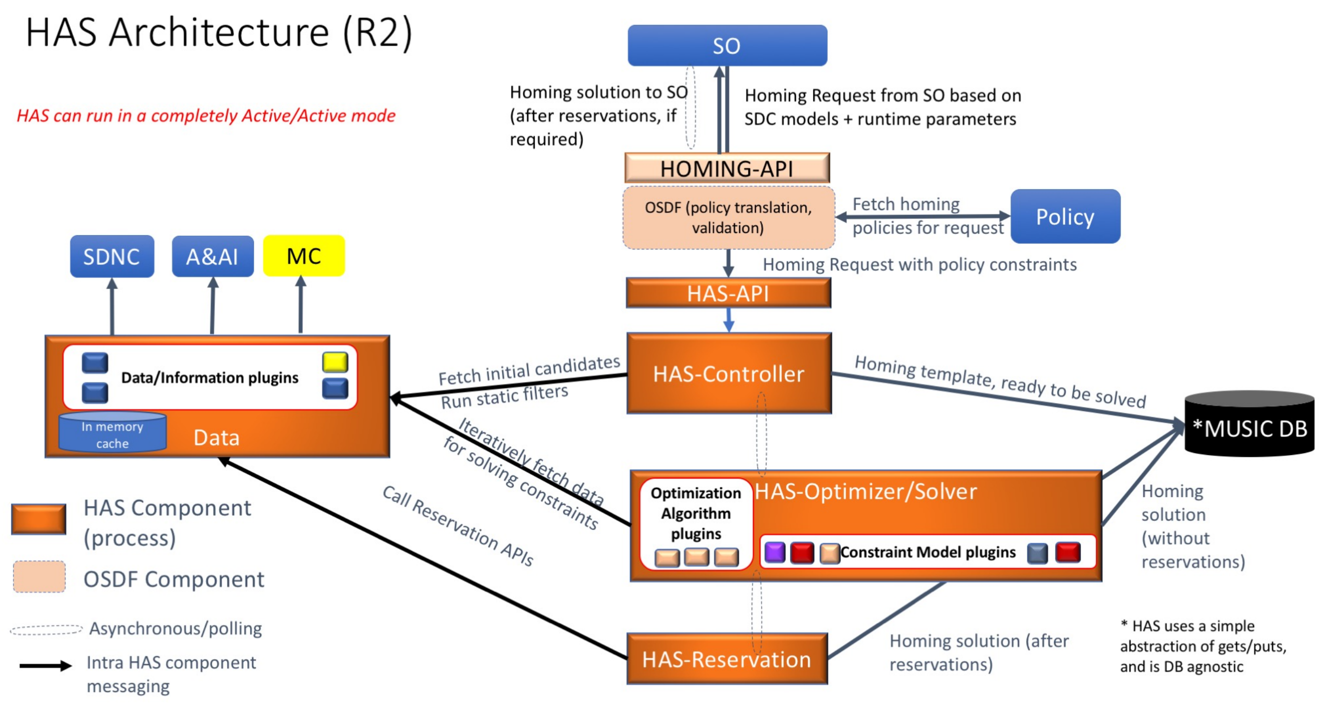
Below is an illustration of HAS interactions with other ONAP components to enable Policy driven homing. The homing policy constraints have been expanded (and categorized) to highlight the range of constraints that could be provided to HAS for determining the homing solution. The figure also shows how HAS uses a plugin-based approach to allow an extensible set of constraints and data models.



Multi Cloud (MC)
Cluster Capabilities, Capacity, Topology
Infra Class - Resource Utilization/Reservation
SDNC
Capacity
A&AI
Available Cloud/service instances
DCAE
DMaaP Replication
Decomposed Service components (Demands)
from SO
Cloud Agnostic Std. Data Model from MC, Other plugins
HOMING (OF-HAS)
Constraint Model plugins
Algorithm plugins
to SO
Optimized Homing recommendations
from Policy
Homing Constraints
Latency
Distance
Regulatory
Bandwidth
Proximity/Colocation (virtual & physical)
Security
Diversity (Disaster Zones)
Latency (Customer)
Distance (Customer)
Cost (Provider)
Load balancing (Provider)
Site Reliability
Cluster SW Capabilities (Availability zones, Affinity/Anti-Affinity)
Cluster HW Capabilities (SRIOV, Hardware encryption, Transcoding, NUMA boundaries)
Aggregate Capacity (Tenant, Hosts etc.)
Aggregate Utilization (Tenant, Hosts etc.)
Capacity check
Quota
Constraint Categories
Service Requirements
Runtime Metrics
Optimization Objectives
Runtime Queries
Cloud Capabilities

More information on how homing constraints are specified can be found at OOF-HAS Homing Specification Guide, and a sample homing template has been drawn up for residential vCPE Homing Use Case.

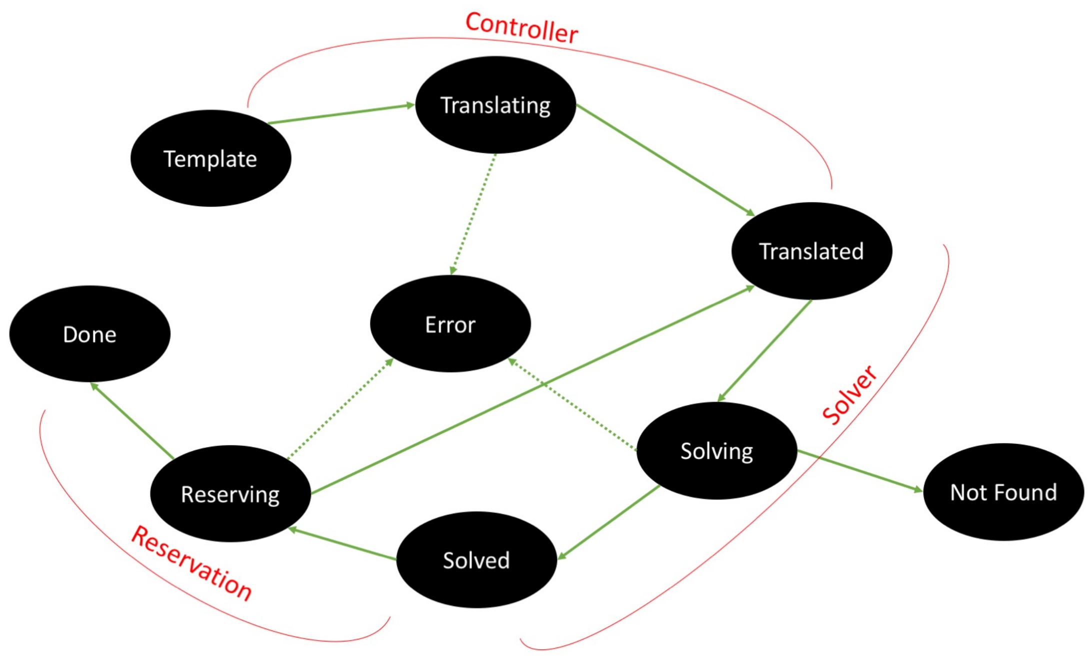
HAS Architecture (R2)


HAS Architecture (R2)
HAS can run in a completely Active/Active mode
SO
Homing solution to SO (after reservations, if required)
Homing Request from SO based on SDC models + runtime parameters
HOMING-API
OSDF (policy translation, validation)
Fetch homing policies for request
Policy
Homing Request with policy constraints
HAS-API
SDNC
A&AI
MC
Data/Information plugins
In memory cache
Data
Fetch initial candidates
Run static filters
HAS-Controller
Homing template, ready to be solved
*MUSIC DB
Iteratively fetch data for solving constraints
Optimization Algorithm plugins
HAS-Optimizer/Solver
Constraint Model plugins
Homing solution (without reservations)
Call Reservation APIs
HAS-Reservation
Homing solution (after reservations)
* HAS uses a simple abstraction of gets/puts, and is DB agnostic
HAS Component (process)
OSDF Component
Asynchronous/polling
Intra HAS component messaging

HAS - Active-Active High Availability Architecture

HAS is implemented based on an active/active high availability architecture (HAS - Active-Active High Availability Architecture), where each component of HAS can scale horizontally independent of the others. This also allows HAS to have highly scalable hybrid deployment architectures (OOF Beijing R2 OOM Deployment Planning).

Lifecycle of a Homing request in HAS

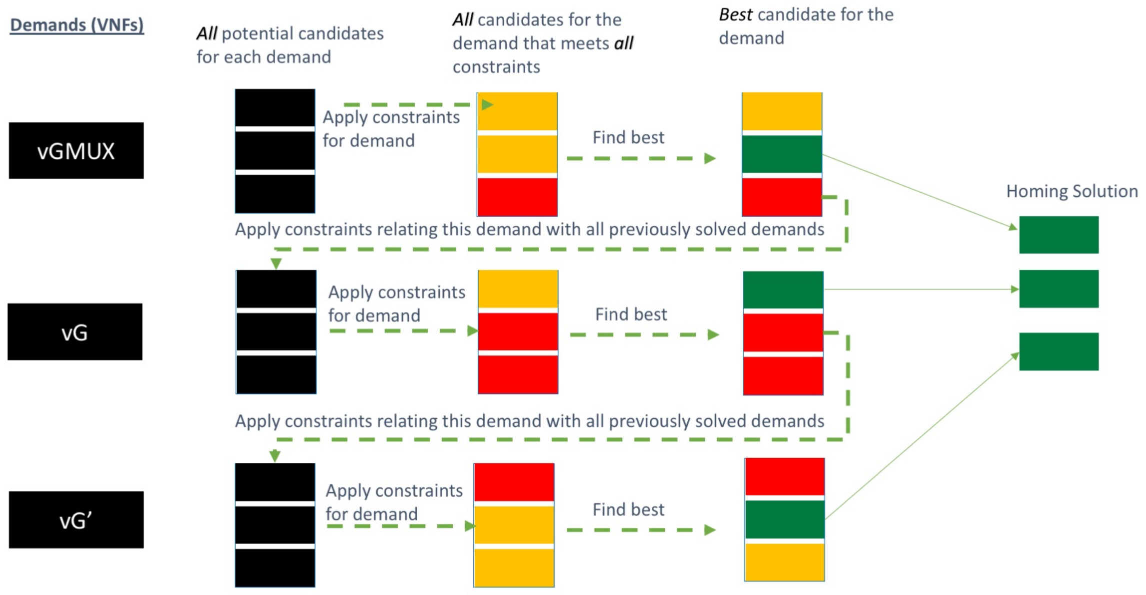


Use cases

Residential vCPE: vCPE Homing Use Case

5G RAN: Homing 5G RAN VNFs

A sample heuristic greedy algorithm of HAS


Demands (VNFs)
All potential candidates for each demand
All candidates for the demand that meets *all* constraints
Best candidate for the demand
vGMUX
Apply constraints for demand
Find best
Homing Solution
Apply constraints relating this demand with all previously solved demands
vG
Apply constraints for demand
Find best
Apply constraints relating this demand with all previously solved demands
vG’
Apply constraints for demand
Find best

Guide to writing Homing Specifications

HAS is service agnostic by design and the OOF-HAS Homing Specification Guide can help create homing specifications for new services.

Triaging Homing decisions

Triaging HAS homing decisions

HAS Developer guide

The HAS Developer Guide will give more information on how to deploy HAS, and contributing to the HAS code.

HAS Code information

Gerrit: https://gerrit.onap.org/r/#/admin/projects/optf/has

Master Branch : https://git.onap.org/optf/has/

Beijing Branch: https://github.com/onap/optf-has/tree/beijing

Beijing Release Artifacts:

https://nexus.onap.org/content/repositories/releases/org/onap/optf/has/optf-has-conductor/1.1.1/ (binaries)
https://nexus.onap.org/content/repositories/releases/org/onap/optf/osdf/optf-osdf/1.1.1/ (binaries)

nexus3.onap.org:10001/onap/optf-has:1.1.1 (docker image)
nexus3.onap.org:10001/onap/optf-osdf:1.1.1 (docker image)