

# ETSI-Alignment Architecture and Roadmaps - ETSI NFV Workshop Presentation

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Orchestration Scenarios (a.k.a. ETSI-Alignment) Task Force weekly meeting,  
Weekly meeting: Mondays at 12PM UTC, 5AM PT, 8AM ET, 2PM CET, 5:30PM India, 8PM  
China. <https://zoom.us/j/722438866>  
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ETSI Alignment Support, <https://wiki.onap.org/display/DW/ETSI+Alignment+Support>

# Agenda

1	ETSI MANO and ONAP ETSI Alignment Landscape
2	ONAP ETSI-Alignment Overall Architecture
3	ONAP ETSI Catalog Management Component
4	ONAP ETSI VNF Package Management Interfaces
5	SOL003 Adapter Architecture & Use Cases
6	SOL005 Adapter Architecture & Use Cases
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8	Communication Security between ONAP and SVNFM/NFVO *
9	CNF Support *
10	Hierarchical ETSI-Based Orchestration *
11	ETSI-Alignment Requirements and Roadmaps

\* Challenges for future releases

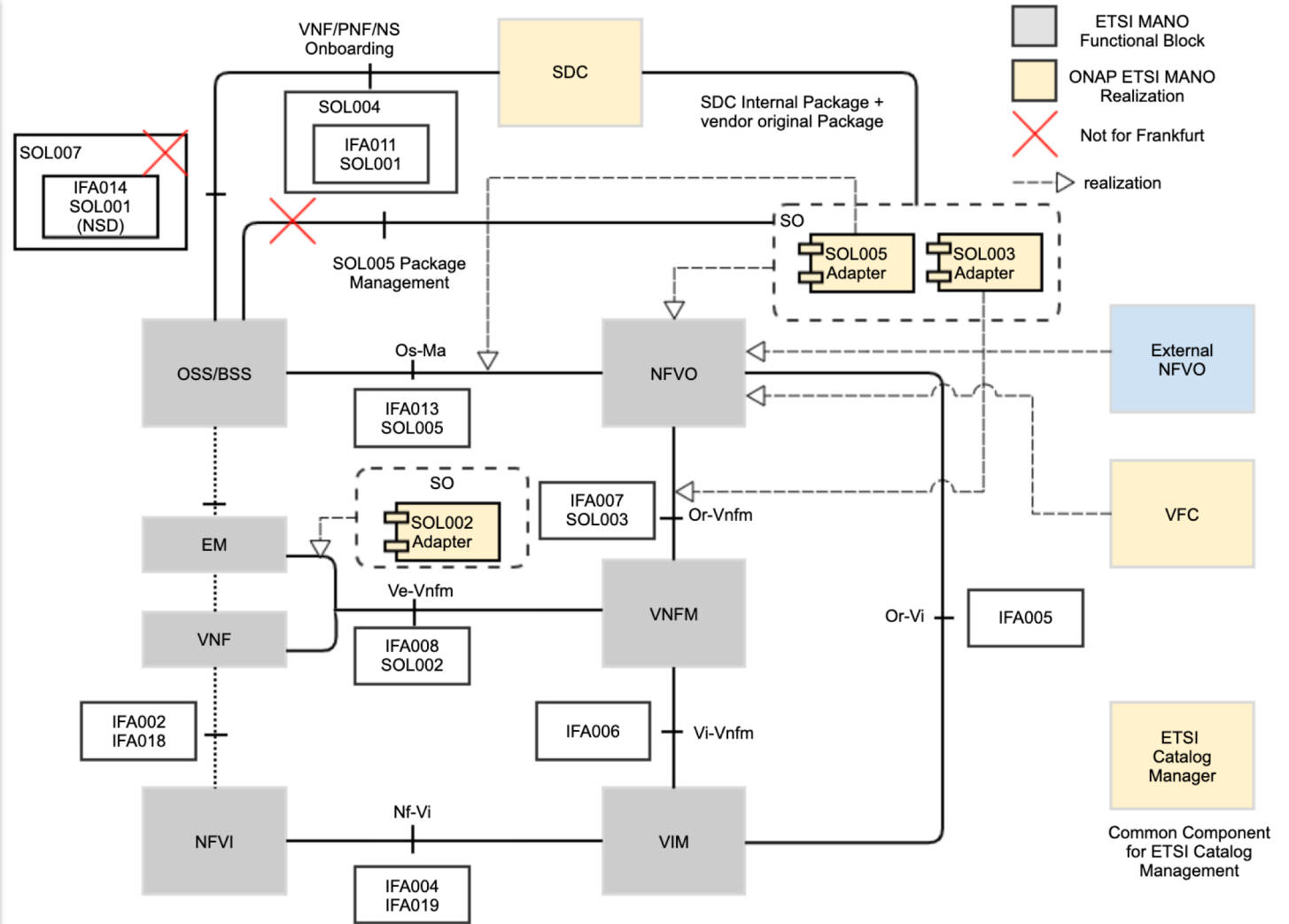
# ETSI MANO and ONAP ETSI Alignment Landscape

As part of aligning ONAP to ETSI MANO, ONAP supports ETSI standards for packaging, LCM operations, security for managing VNF, PNF and NS.

- For packaging, the SOL004 standard is used for the VNF and PNF package, and the SOL007 standard will be used for the NS package
  - SOL007 support is not for Frankfurt
  - SOL005 Package onboarding to SO is not for Frankfurt
- VNF, PNF and NS descriptors are described by the SOL001 standard.
- The SOL003 standard is used for VNF LCM, Package Management and Monitoring.
- The SOL005 standard is used for NS LCM and VNF Package Management and Monitoring.
- The SOL002 standard is used for VNF/VNFC-level EM triggered scenarios (LCM, Fault, Performance, Configuration).
- ETSI Package and communication security are supported.

## ONAP components target realization of ETSI MANO

- SDC realizes SOL004 and SOL007 package onboarding, design and distribution functionalities.
  - SOL007 package onboarding is not for Frankfurt
- External NFVO and VFC realize the NFVO functionalities.
- SOL003 Adapter realizes the Or-Vnfm (SOL003) interface.
- SOL005 Adapter realizes the Os-Ma (SOL005) interface.
- SOL002 Adapter realizes the Ve-Vnfm (SOL002) interface.
- ETSI Catalog Manager provides ETSI Catalog/Package management.



# ONAP ETSI-Alignment Overall Target Architecture

ONAP will be aligned with ETSI standards: SOL004, SOL007, SOL001, SOL003, SOL005, SOL002

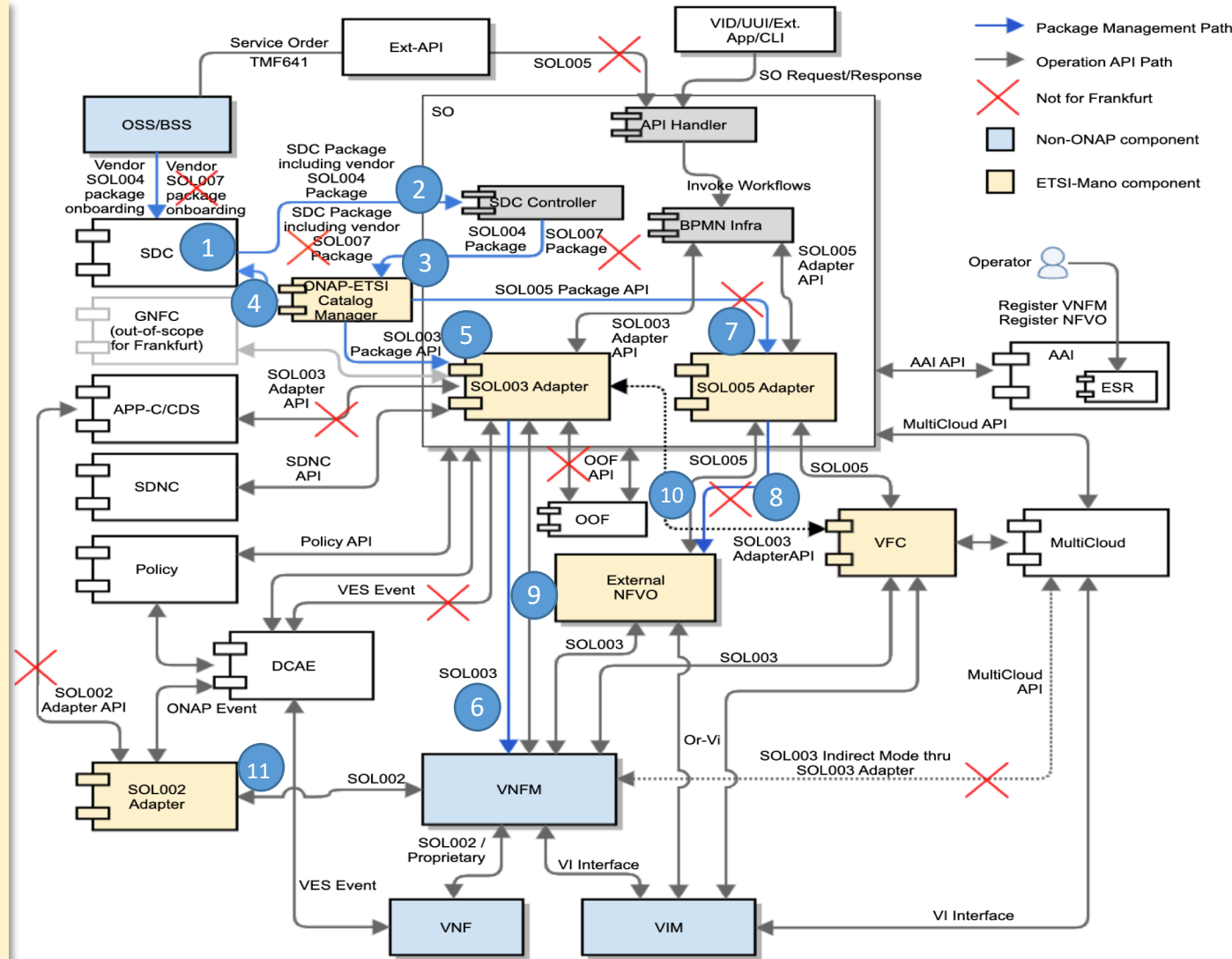
- SDC supports SOL004 Package Onboarding
  - SDC CSAR embeds the vendor SOL004 package in an ONAP VNF package
  - SOL007 package support will not be in Frankfurt**
- SO (SDC Controller) gets an SDC package notification and queries for the SDC package including the vendor SOL004 package (**SOL007 is not for Frankfurt**)
- SDC Controller invokes the ETSI Catalog Manager (common component) to store vendor packages, by passing the CSAR Id
- ONAP-ETSI Catalog Manager queries for the SDC CSAR and stores the SOL004 vendor packages in its database
- SOL003 Adapter supports VNF package management and LCM
- SOL003 Adapter forwards VNF packages to VNF over SOL003 Package Management Interface
- SOL005 Adapter queries for NS/PNF descriptors & VNF packages (**not for Frankfurt**)
- SOL005 Adapter forwards NS/PNF descriptors & VNF packages to External NFVO (**not for Frankfurt**)
- SOL003 Adapter supports SOL003 Operations
- SOL005 Adapter supports SOL005 Operations
- SOL002 Adapter supports SOL002 Operations

Note: SOL003/SOL005/SOL002 Adapters will be designed to leverage common functionalities such as: Security, HPA, AAI, Policy, ETSI Catalog Manager

SOL005 Northbound support is not for Frankfurt

SOL003/SOL002 Adapter NBI GNFC-Ready & APPC/CDS are not for Frankfurt

SOL003 Adapter DCAE event mapping is not for Frankfurt



For more architecture and design details: <https://wiki.onap.org/display/DW/ETSI+Alignment+Support>

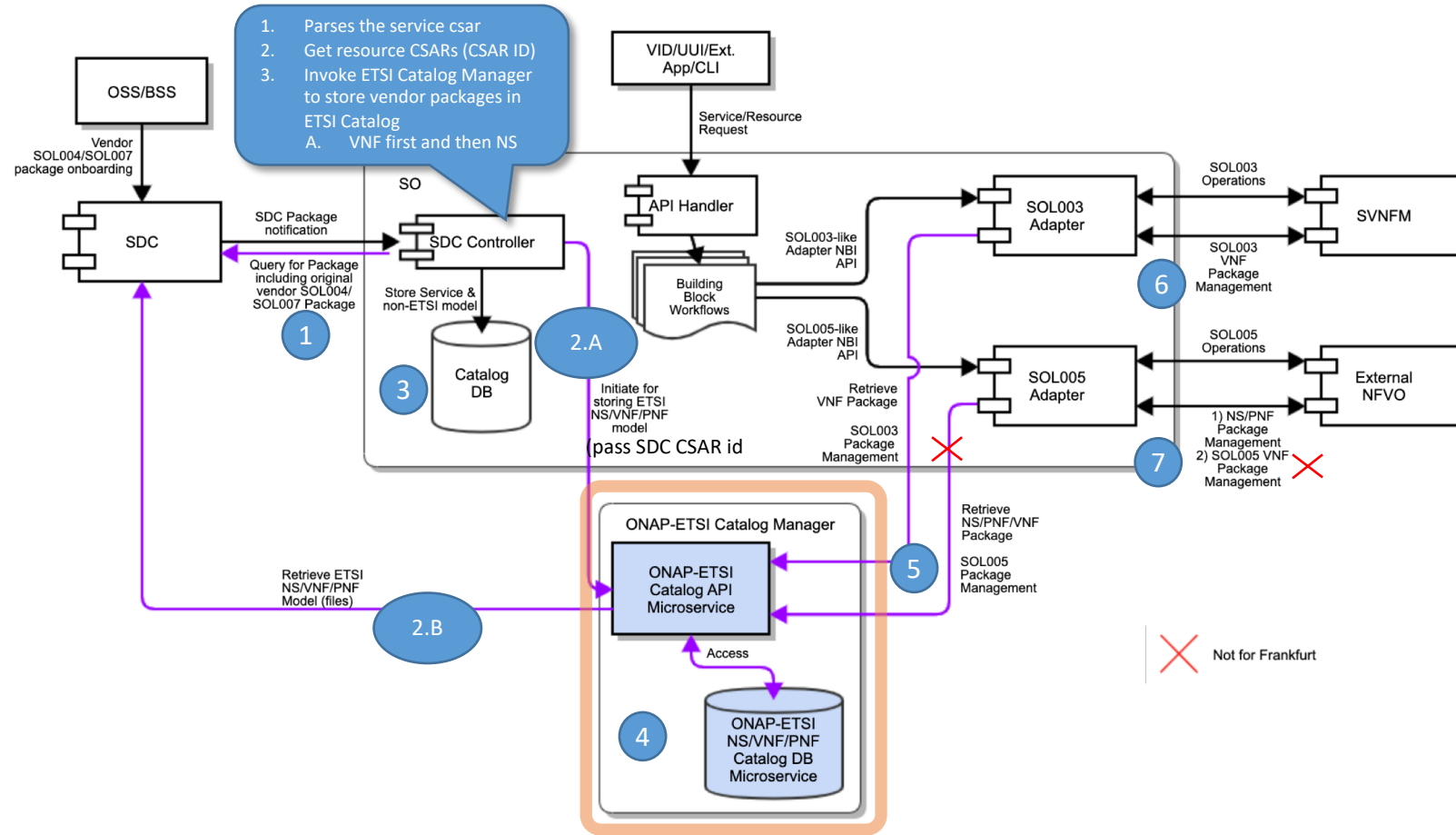
# ONAP ETSI Catalog Management Component

CMCC, ZTE

ETSI Catalog Manager is a common component.

1. SO (SDC Controller) queries the package from SDC.
2. SO invokes ETSI Catalog Manager for storing vendor packages to the ETSI Catalog database
  - A. ONAP-ETSI Catalog Manager APIs are used for storage of vendor packages, by passing the SDC CSAR ID
  - B. ETSI Catalog Manager will retrieve the CSAR file(s) from SDC and extract embedded ETSI package(s)
3. For Non-ETSI models (Service + Non-ETSI Resource, metadata), SO uses the existing SO embedded Catalog DB
4. **ONAP-ETSI Catalog Manager provides package management APIs and Catalog Database**
  - A. **Catalog\_NSPackage**
  - B. **Catalog\_VNFPackage**
  - C. **Catalog\_PNFPackage**
  - D. **Catalog\_SoftwareImageModel**
5. SOL003/**SOL005** Adapter accesses ONAP-ETSI Catalog through ONAP-ETSI Catalog Manager APIs
6. SOL003 Adapter provides SOL003 Package Management APIs to SVNFM
7. SOL005 Adapter provides SOL005 Package Management APIs to External NFVO (**not for Frankfurt**)

Note: PNF package distribution use cases are under discussion.

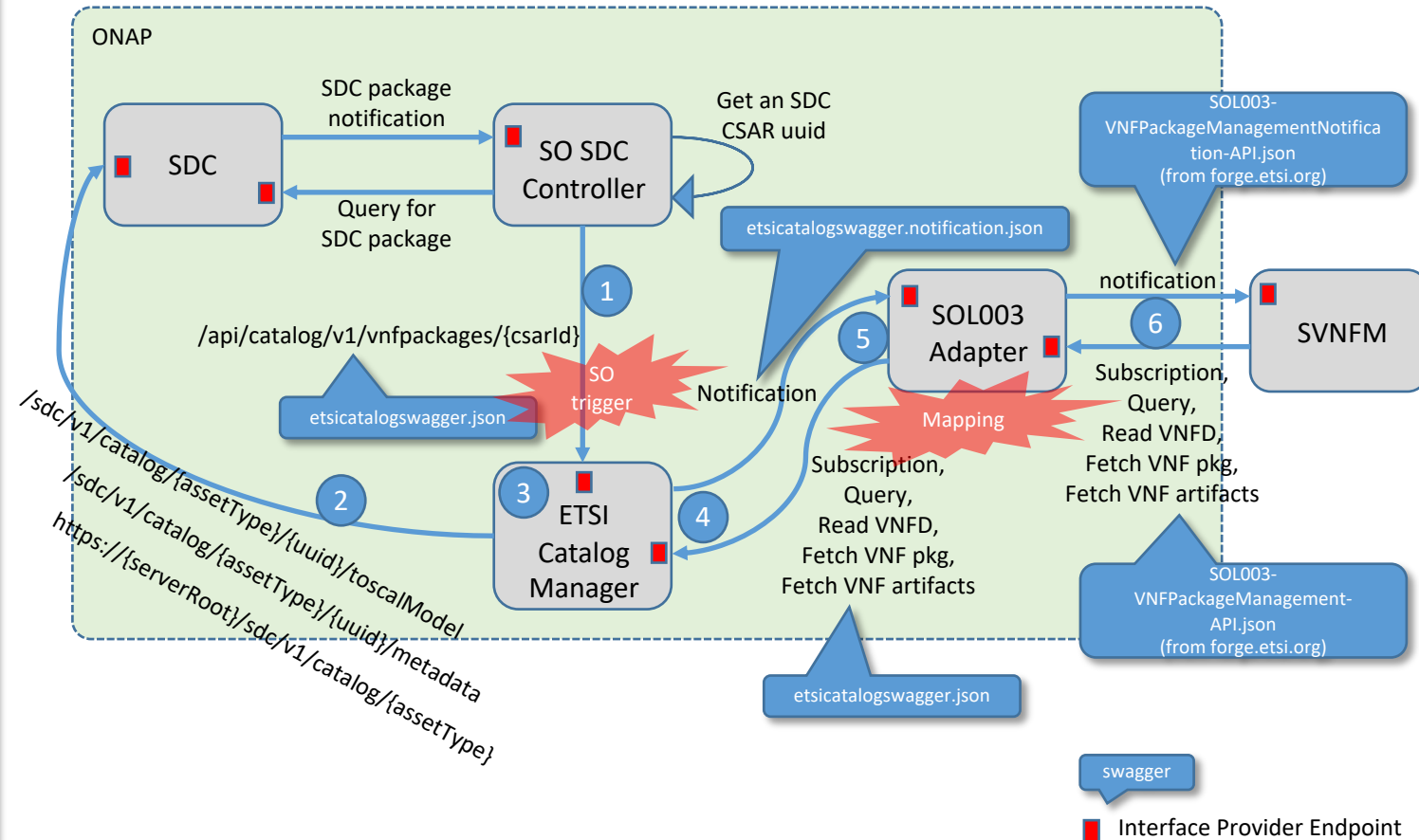


- The Catalog Manager is a common component (part of Modelling project)
- It could be evolved to store other catalogs.
- ETSI Catalog Documentation Wiki page: <https://wiki.onap.org/display/DW/Etsicatalog+Documentation>

# ONAP ETSI VNF Package Management Interfaces

CMCC, Ericsson, ZTE

1. SO SDC Controller -> ETSI Catalog Manager
  - /api/catalog/v1/vnfpackages/{csarId}
  - pass the sdc csar uuid
2. ETSI Catalog Manager -> SDC
  - /sdc/v1/catalog/{assetType}/{uuid}/toscaModel (download CSAR)
  - /sdc/v1/catalog/{assetType}/{uuid}/metadata
3. ETSI Catalog Manager
  - Get an SDC CSAR and extract the vendor SOL004 package from the Onboarded\_Package artifact directory
  - Store the vendor SOL004 package into the ETSI Catalog Manager DB
4. ETSI Catalog Manager provides package management APIs and package management notification APIs based on the SOL003 specification.
  - etsicatalog.swagger.json
  - etsicatalog.swagger.notification.json
  - For more details, see <https://wiki.onap.org/display/DW/ETSI+Catalog+Management> > SO ETSI Catalog DB Support for NS, VNF and PNF packages
5. SOL003 Adapter provides notification APIs for ETSI Catalog Manager and invokes the package management APIs.
6. SOL003 Adapter and SVNFM use SOL003 package management APIs.
  - SVNFM implements VNF package management notification API



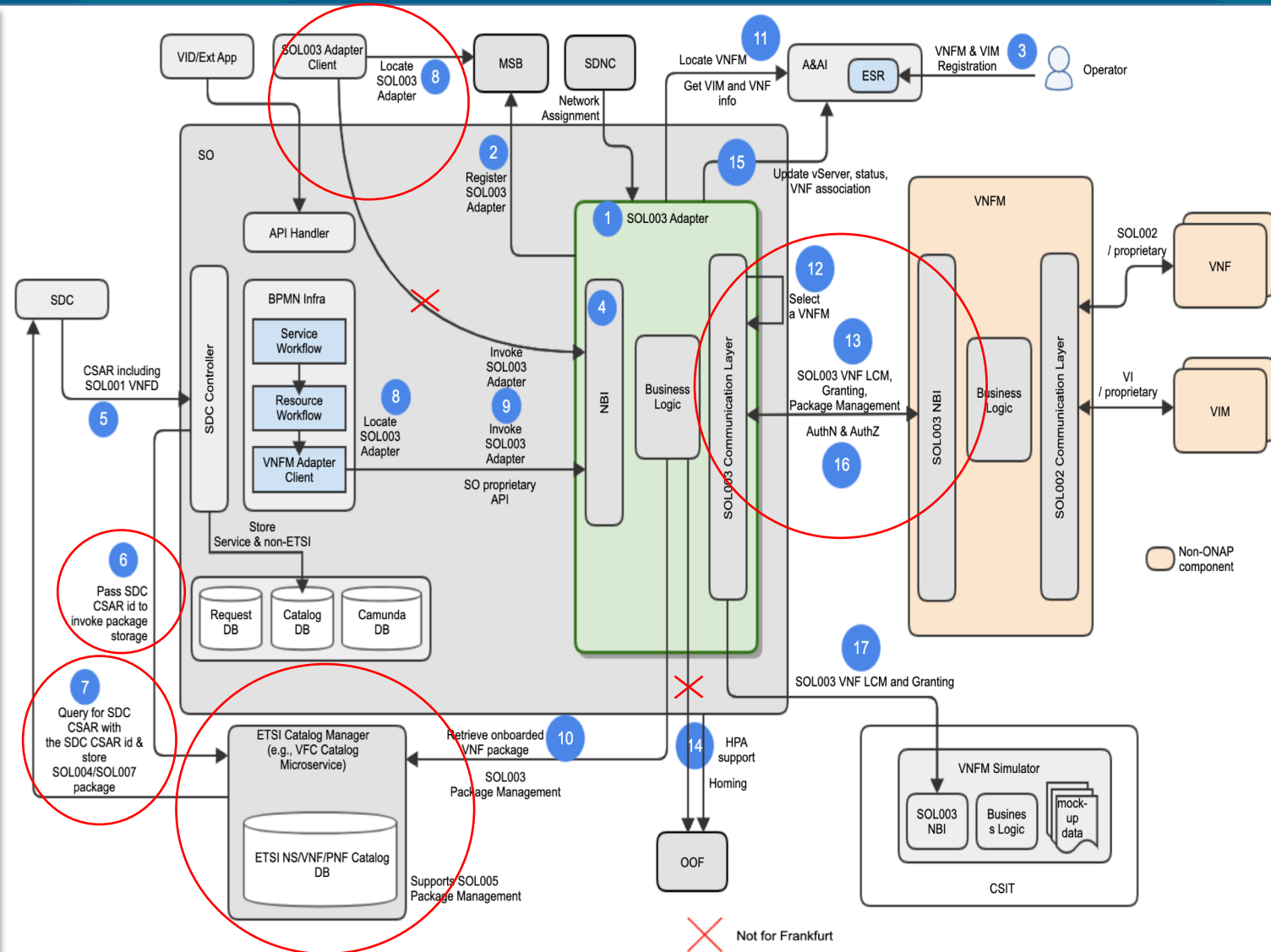
Note: Direct interface between SDC and ETSI Catalog Manager is under discussion.

ETSI Catalog Documentation Wiki page: <https://wiki.onap.org/display/DW/Etsicatalog+Documentation>

ETSI Catalog Management Wiki Page: <https://wiki.onap.org/display/DW/ETSI+Catalog+Management>

# SOL003 Adapter Architecture & Use Cases

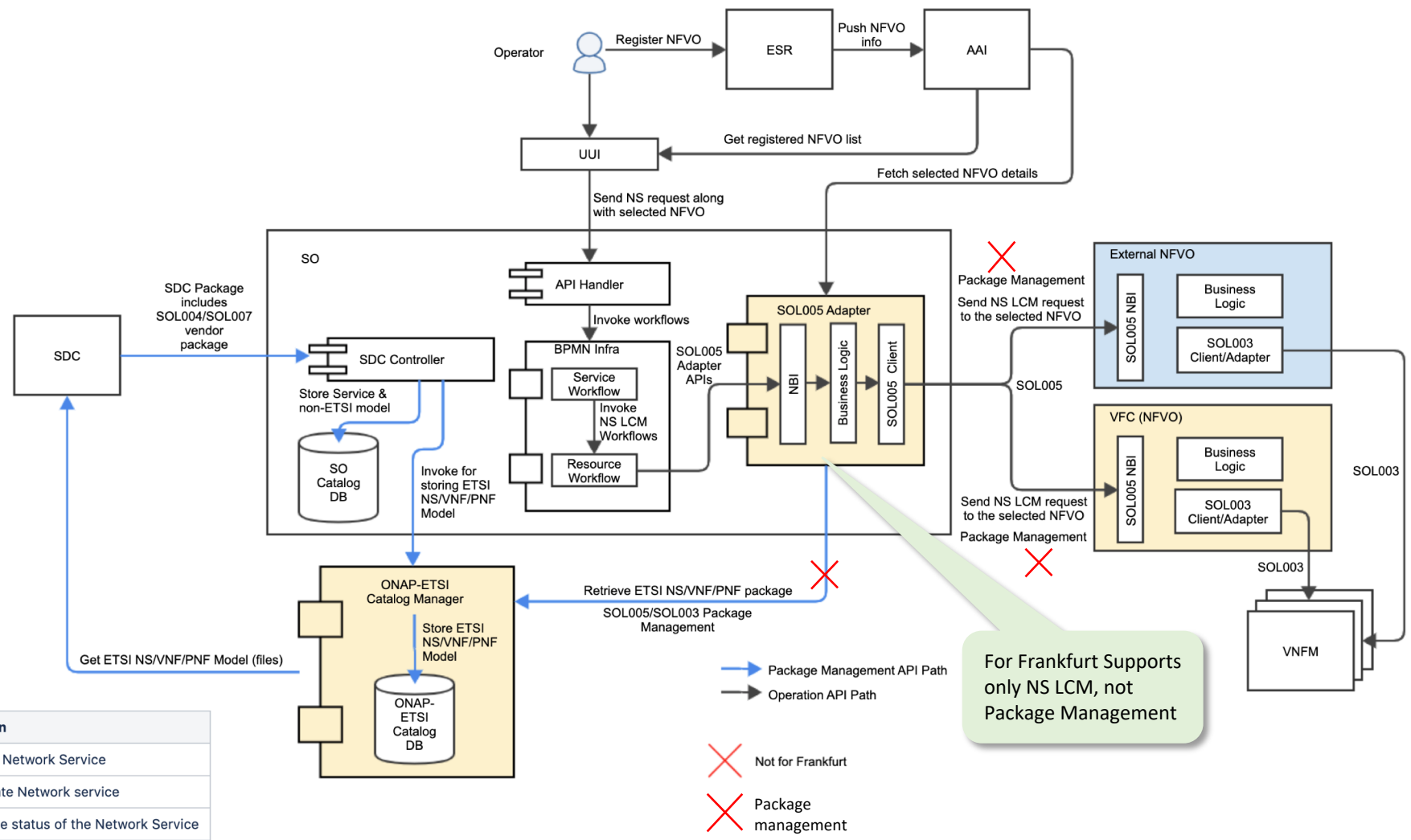
- SOL003 Adapter is a SO microservice component
- SOL003 Adapter is registered to MSB.
- Operator registers VNFM and VIM to ESR in AAI.
- SOL003 Adapter exposes its NBI to any SOL003 Adapter client in ONAP (not for Frankfurt)
  - Interfaces will be refactored to be generic to allow access by other ONAP components.
  - The NBI will be enhanced for additional SOL003 operation support
- SDC distributes SDC packages including the vendor original SOL004 (VNF and PNF) and SOL007 (NS) packages – **SOL007 is not for Frankfurt**
- SO (SDC Controller) passes the SDC CSAR ID to ETSI Catalog Manager to invoke storage
- ETSI Catalog Manager queries for SDC CSAR with the SDC CSAR id & store SOL004 package.
- SO (BPMN) and the SOL003 Adapter client locates SOL003 Adapter.
- SO (BPMN) and the SOL003 Adapter client invokes SOL003 Adapter.
- SOL003 Adapter retrieves VNF package from Catalog Manager.
- SOL003 Adapter gets available VNFM locations (endpoints) and gets VIM and VNF Info.
- SOL003 Adapter selects a VNFM, based on a VNFM locating mechanism.
- SOL003 Adapter and SVNFM supports SOL003 VNF LCM, granting and package management operations.
- SOL003 Adapter supports HPA-based Granting, leveraging OOF.
- SOL003 Adapter updates vServer, status and VNF association in AAI
- SOL003 Adapter and SVNFM support authentication and authorization (AAF, and vendor AA mechanism) – partially for Frankfurt.
- For integration testing, the VNFM Simulator is used.



# SOL005 Adapter Architecture & Use Cases



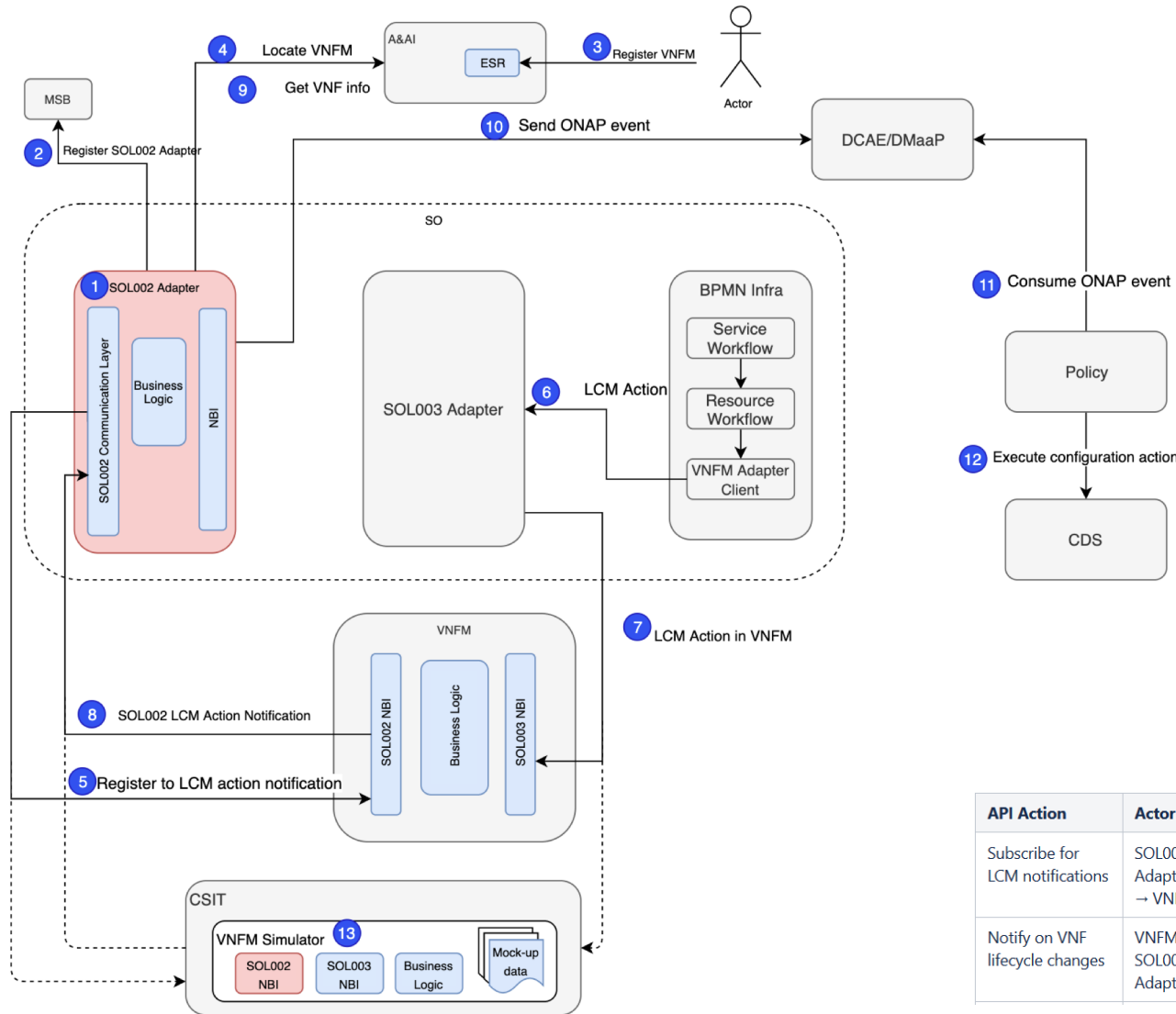
- SOL005 Adapter is a Microservice that will make connections between SO and VF-C/External NFVO through SOL005 standards.
- SOL005 Adapter will support the following APIs in Frankfurt
  - NS LCM : Create NS, Delete NS, Get NS, Instantiate NS, Terminate NS
  - Package/Descriptor Management is not for Frankfurt**
  - NSD Management : Subscribe, Query Subscription Information, Terminate Subscription, Notify
  - VNF Package Management : Fetch VNF Package Artifacts, Subscribe, Query Subscription Information, Terminate Subscription
- Use Cases
  - Operator registers NFVO to ONAP via ESR
  - ESR registration entities are pushed to AAI
  - Operator sends NS requests from UI along with selected NFVO details
  - SOL005 Adapter fetches NFVO details from AAI
  - SOL005 Adapter sends the requests to NFVO



API Action	Method	URI	Description
Create NS	POST	/ns_instances	To create a Network Service
Instantiate NS	POST	/ns_instances/{nsInstanceId}/instantiate	To instantiate Network service
Get NS Details	GET	/ns_instances/{nsInstanceId}	To query the status of the Network Service
Terminate NS	POST	/ns_instances/{nsInstanceId}/terminate	To Delete Network Service Instance



# SOL002 Adapter Architecture & Use Cases



- SOL002 Adapter will be an SO micro-service that makes connections between VNFMs and ONAP (as Element Manager) through ETSI defined Ve-Vnfm interface
  - SOL002 Adapter registers to MSB
  - Operator registers VNFMs to ESR in AAI
  - SOL002 Adapter locates VNFMs via AAI
  - SOL002 Adapter subscribes for VNFMs notifications
  - SOL002 Adapter receives calls from VNFMs
  - SOL002 Adapter gets VNF info from AAI
  - SOL002 Adapter sends ONAP events to DCAE/DMAaP
  - VNFMs Simulator will be enhanced to interact with the SOL002 Adapter for SOL002 use case testing
- Use Case for Frankfurt
  - SOL002 Adapter subscribes and consumes VNF LCM notifications from VNFMs

API Action	Actor	Method	URI	Description
Subscribe for LCM notifications	SOL002 Adapter → VNFMs	POST	/vnflcm/v1/subscriptions (LcmSubscriptionRequest)	To create subscription for LCM notification
Notify on VNF lifecycle changes	VNFMs → SOL002 Adapter	POST	/lcm/v1/vnf/instances/notifications (VnflcmOperationOccurrenceNotification)	To notify SOL002 adapter on VNF lifecycle changes

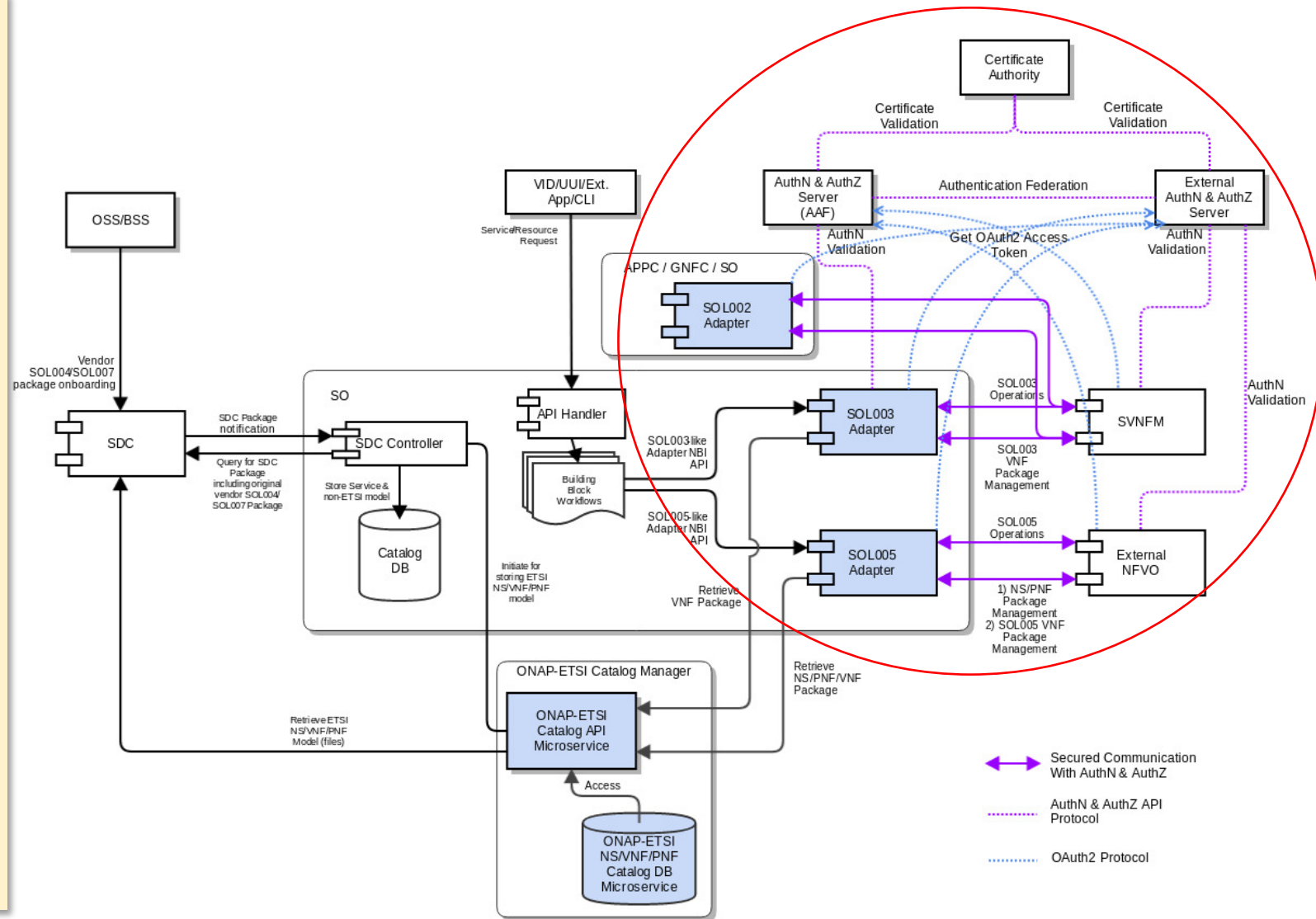
# Communication Security between ONAP and SVNFM/NFVO (Challenge)

- SOL003/SOL005/SOL002 Adapters will communicate with the SVNFM/NFVO via **secured HTTPS protocol** with authentication and authorization.
  - SOL003/005 API call security needs to conform to OAuth2
  - SOL003/005 Notification call security needs to conform to OAuth2 or HTTP Basic authorization (user/pass)
  - SOL003/005 Adapters will leverage the AAF security mechanism (as authorization server)
  - Currently, SOL003 Adapter supports one-way and two-way AA.
  - SOL002 Adapter will use OAuth2 Token-based authentication
- SVNFM/NFVO will be allowed to have their own security mechanisms based on their security requirements but is **required to support OAuth2 and HTTP Basic Authentication**.
  - Authentication Federation between the Adapters and the SVNFM/NFVO is under discussion.
  - Some vendors prefer SAML-based federation
    - AAF Authentication and External Authentication Server will exchange authentication tokens, based on federation configuration. It depends on AAF.
    - In the Frankfurt release, the authentication federation may not be supported.

Note 1: All SO external interfaces for other ONAP components (e.g., SDC, ONAP-ETSI Catalog Manager, VID, AAI, SDNC, OOF) will be secured in the Frankfurt release by leveraging AAF.

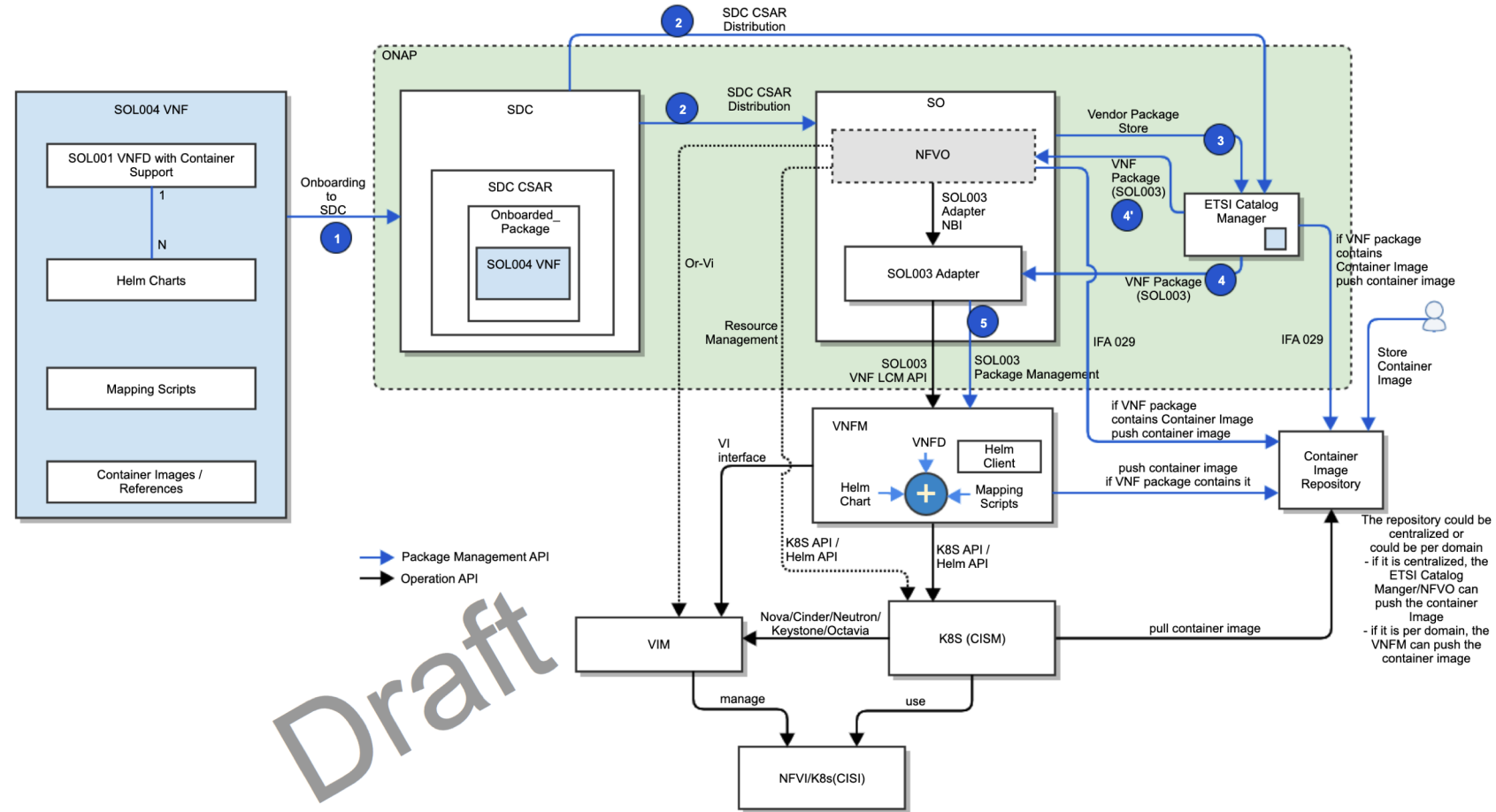
Note 2: SOL002 Adapter will also leverage the AAF security mechanism and will support OAuth2 and HTTP Basic.

Note 3: More communication Security use cases are under discussion.



# CNF Support (Challenge)

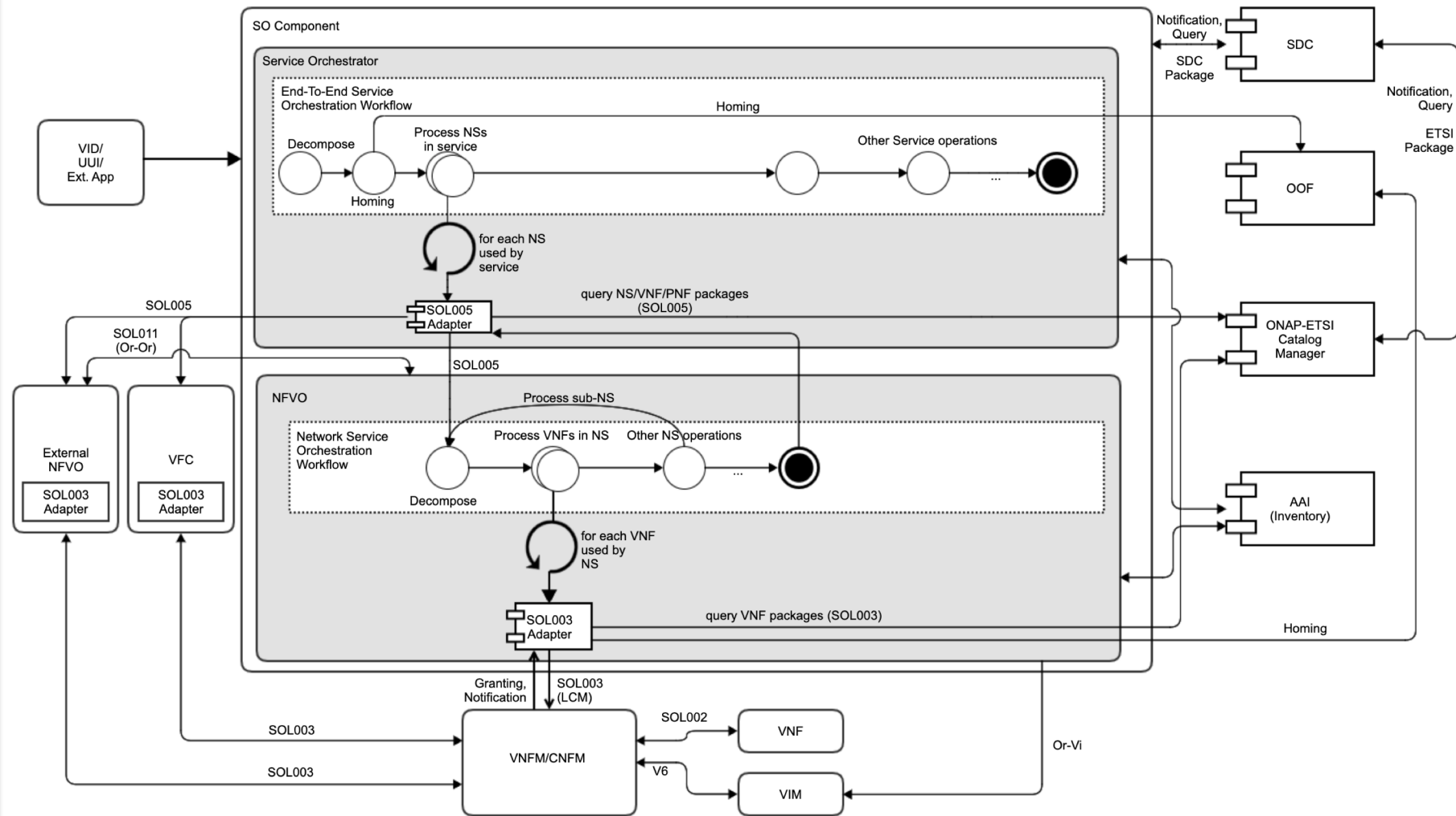
- Hybrid orchestration templates – TOSCA VNFD and Helm Charts (MCIO)
  - TOSCA VNFD drives the interaction between NFVO and VNFM and NS/VNF LCMs
  - Helm Charts are included as a binary archive in the VNF package, and are consumed by VNFM
- Container images are either included in the VNF package or referenced in the descriptors (URL to CIR)
  - If the VNF package includes Container images, NFVO/ETSI Catalog Manager uploads them to the CIR
  - Otherwise, operators store Container images to the CIR
- Parameter mapping from Or-Vnfm (SOL003) incoming information to Helm input parameters
- Resource Mapping between resources in TOSCA VNFD and K8S resources described in Helm chart (for granting between VNFM and NFVO)
- Mapping the LCM operations to HELM commands (VNFM behavior triggered on Or-Vnfm), etc.
- VNFM-K8S communication prefers Helm APIs to lower level K8S APIs
- K8S-VIM/CIM communication uses de facto open source standards (Nova/Cinder/Neutron/Keystone/Octavia)



- The above diagram is a draft, based on a CNF PoC and IFA 029. It will be refined by conforming to the coming ETSI CNF standards.
- If the vendor VNFM has CNF capabilities, SO will leverage it through the SOL003 Adapter. Otherwise, SO/NFVO could invoke K8S API/Helm API towards K8S (TBD)

# Hierarchical ETSI-based Orchestration (Challenge)

- The diagram depicts the orchestration functional blocks
- It is an ETSI-based hierarchical orchestration concept, to facilitate ONAP orchestration adoption by operators who have their own NFVOs and/or VNFMs
  - E2E, NS, VNF, CNF orchestration by leveraging ETSI standards
- Working with the existing VFC and external NFVOs
- Leveraging the common ETSI Catalog Manager
- Leveraging the common OOF for homing
- Possible ONAP SO embedded NFVO block
  - Handle NS LCM Orchestration
  - Take over Granting and Package Management from the SOL003 Adapter
  - Support SOL005 Northbound Interface
  - Support Or-Vi Indirect Resource control for VIM
  - Possibly, interface with other peer NFVOs (Or-Or)



# ETSI-Alignment Requirements & Roadmaps

Dublin	El Alto	Frankfurt Support	Guilin Proposals	Future Topics
<ul style="list-style-type: none"> <li>ETSI SOL 2.5.1 support</li> <li>SOL003 Adapter               <ul style="list-style-type: none"> <li>Create VNF</li> <li>Instantiate VNF</li> <li>Terminate VNF</li> <li>Delete VNF</li> <li>Subscription</li> <li>Notification</li> <li>Granting</li> </ul> </li> <li>SO ETSI VNF BB Workflows</li> <li>VNFM Simulator in the SO project</li> <li>SDC SOL004 PNF onboarding</li> </ul>	<ul style="list-style-type: none"> <li>ETSI SOL 2.5.1 support</li> <li>CSIT (test automation) for SOL003 Adapter</li> <li>SOL003 Adapter Bug fixes</li> <li>Communication security between SOL003 Adapter and SVNFM               <ul style="list-style-type: none"> <li>HTTPS support</li> <li>SpringBoot-based authentication</li> </ul> </li> <li>VNFM Simulator migration to the Integration Test project</li> <li>SDC SOL004 VNF and PNF onboarding</li> </ul>	<ul style="list-style-type: none"> <li>ETSI SOL 2.5.1 support</li> <li>SO &amp; SOL003 Adapter enhancements               <ul style="list-style-type: none"> <li>SO SOL004 and SOL001 package storage/retrieval support leveraging ETSI Catalog Manager</li> <li>SOL003-based package management API support</li> </ul> </li> <li>SOL003 VNF LCM Operations</li> <li>ETSI Catalog Manager               <ul style="list-style-type: none"> <li>Storing vendor ETSI packages</li> <li>Providing ETSI package APIs to the SOL003/SOL005 Adapters</li> <li>Software Image delivery</li> </ul> </li> <li>SOL005 Adapter for               <ul style="list-style-type: none"> <li>Create NS</li> <li>Instantiate NS</li> <li>Terminate NS</li> <li>Delete NS</li> </ul> </li> <li>SOL002 Adapter               <ul style="list-style-type: none"> <li>VNF LCM notification</li> </ul> </li> <li>AAF-based HTTPS and Authentication – partial OAuth2 support</li> </ul>	<ul style="list-style-type: none"> <li>ETSI SOL 2.7.1 support</li> <li>SDC enhancements               <ul style="list-style-type: none"> <li>SOL007 NS package onboarding</li> <li>SOL001 NSD and VNFD mapping to SDC AID DM</li> </ul> </li> <li>SOL003 Adapter enhancements and additional SOL003 operations support               <ul style="list-style-type: none"> <li>SOL003 NBI enhancements for GNFC-ready</li> <li>VNF Query</li> <li>VNF Modify (ModifyVnfInfo)</li> <li>VNF Heal</li> <li>Policy-based Scaling (VNF-level and/or VF-Module-level)</li> <li>SOL003 LCN and translation into DCAE events (FM/PM)</li> <li>High Availability and Fault-Tolerant</li> <li>Granting with HPA via OOF</li> </ul> </li> <li>OOF VNF-level Homing Request Support</li> <li><b>CNF support</b></li> <li>Model-Driven Orchestration leveraging,               <ul style="list-style-type: none"> <li>Puccini? CDS integration?</li> </ul> </li> <li>SOL005 Northbound Interface support</li> <li>SOL005 Adapter enhancements               <ul style="list-style-type: none"> <li>ETSI Package Management</li> <li>Security</li> <li>Additional NS LCM</li> <li>FM/PM</li> <li>Configuration</li> </ul> </li> <li>OAuth2-based authentication support between SOL002/SOL003/SOL005 Adapters and SVNFM/NFVO</li> </ul>	<ul style="list-style-type: none"> <li>SDC SOL007 Design and generation of SOL004/SOL007 packages</li> <li>ETSI-based VNF software upgrade</li> <li>SOL011 Or-Or interface to support multi-domain orchestration.</li> <li>ONAP SO embedded NFVO for hierarchical orchestration, as one of the NFVO options – see the hierarchical orchestration section               <ul style="list-style-type: none"> <li>Move package management, Granting, Software-Image handling from SOL003 Adapter to NFVO</li> </ul> </li> <li>NS LCM orchestration support</li> </ul>

Q & A  
Challenges  
Recommendations

# References

- ETSI Alignment Support, <https://wiki.onap.org/display/DW/ETSI+Alignment+Support>
  - ETSI Package Management, <https://wiki.onap.org/display/DW/ETSI+Package+Management>
  - ETSI Catalog Management, <https://wiki.onap.org/display/DW/ETSI+Catalog+Management>
  - Communication Security, <https://wiki.onap.org/display/DW/Communication+Security>
  - SOL003 Adapter, <https://wiki.onap.org/display/DW/SOL003+Adapter>
  - SOL005 Adapter, <https://wiki.onap.org/display/DW/SOL005+Adapter>
  - SOL002 Adapter, <https://wiki.onap.org/display/DW/SOL002+Adapter>
- SOL003 Adapter APIs, <https://wiki.onap.org/display/DW/SO+VNFM+Adapter+APIs>
- SOL003 Adapter Test Case, <https://wiki.onap.org/display/DW/SO+VNFM+Adapter+Test+Case>
- SOL002 Adapter, <https://wiki.onap.org/display/DW/SOL002+Adapter>
- ETSI Catalog Manager, <https://wiki.onap.org/display/DW/Etsicatalog+Documentation>
- SOL003 Package Management API swagger: <https://forge.etsi.org/jenkins/view/All%20jobs/job/NFV%20-%20Network%20Functions%20Virtualisation/job/sol002-sol003-master/42/artifact/build/>
- Orchestration Scenarios (a.k.a. ETSI-Alignment) Task Force weekly meeting,
  - Weekly meeting: Mondays at 12PM UTC, 5AM PT, 8AM ET, 2PM CET, 5:30PM India, 8PM China.
  - <https://zoom.us/j/722438866>
  - One tap mobile: +16699006833,,722438866# US (San Jose)      +16465588656,,722438866# US (New York)



**ONAP**

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Thank you!