



# CASABLANCA SECURITY ENHANCEMENTS FOR 5G USE CASE

- 5G Use Case A : Deployment
- 5G Use Case C : Optimization

Meeting Minutes May 21, 2018

# Casablanca 5G Use Cases with Security Impacts

## 5G Use Case A Deployment :

### PNF Plug and Play (PnP) Registration

- JSON encoded asynchronous Registration event sent via HTTP/TLS from PNF to DCAE.

### Configuration Management (CM)

- SSH from ONAP Controller to NF for CM using NetConf or Ansible.

## 5G Use Case C Optimization :

### Bulk Performance Measurements (PM)

- JSON encoded asynchronous Bulk PM (Option 1) or File Ready (Option 2 & 3) event sent via HTTP/TLS from NF to DCAE.
- SFTP or HTTPS from ONAP File Collector to NF for Bulk PM file transfer (Option 2 & 3).

### Real Time Performance Measurements (RTPM)

- GPB encoded asynchronous RTPM event streamed via TLS/TCP from NF to DCAE.

### Fault Management (FM)

- JSON encoded asynchronous Fault event sent via HTTP/TLS from NF to DCAE.

# Security capabilities needed in ONAP for Casablanca

## HTTP

- Recommend that ONAP eliminate username and password for HTTPS.

## TLS

- DCAE is able to authenticate Vendor or Service Provider X.509v3 certificate for TLS connection.
- ONAP User is able to install Vendor Root CA certificate as trust anchor in ONAP.
- ONAP supports 3 level chain (Root CA, Sub CA and End-Entity certificates).
- Vendor is able to install ONAP Root CA as trust anchor on NF for mutual TLS authentication.

## CA

- Provide CA services to NFs in ONAP for development and testing; enrollment, authentication.
- Support CMPv2 for NF for certificate enrollment and end-entity key renewal in ONAP for development and testing.
- Support integration with Service Provider CA/PKI in ONAP.

## SSH/SFTP

- Create RSA public/private key pair for ONAP Controllers and File Collector (Option 2) to use for SSH/SFTP access into the NF for CM/PM.
- Provision SSH username/public key on NF for Ansible or NetConf access from ONAP Controllers for CM and SFTP from ONAP File Collector for Bulk PM (Option 2).
- Recommend that client should not accept username and password for SSH authentication.

**Impacted ONAP Projects: AAF, DCAE, Controllers, NF Requirements**

# Meeting Minutes – May 17, 2018

## Attendees

- Pierre Close (AT&T)
- Gunner Forssell (Ericsson)
- Jonathan Gathman (AT&T)
- Marge Hillis (Nokia)
- Linda Horn (Nokia)
- Samuli Kuusela (Ericsson)
- Vesa Lehtovirta (Ericsson)
- Zygmunt Lozinski (IBM)
- Natacha Mach (Orange)
- Gervais-Martial Ngueko (AT&T)
- Pawel Pawlak (Orange)
- Alex Salvarani (Nokia)
- Randy Stricklin
- Stephen Terrill (Ericsson)
- Amy Zwarico (AT&T)

Apologies to those I missed or misspelled. Let me know and I can update the list.

# Discussion Points – May 17, 2018

## General

- Goal for these meetings is to identify:
  - Assumptions that impact ONAP security capabilities and NF requirements
  - Recommendations for the Security Subcommittee
  - Requirements for ONAP and NFs
  - Project impacts for Casablanca

## HTTP

- Agreed to the following Recommendations:
  - ONAP shall not support username and password authentication for HTTPS; certificate authentication only.
  - ONAP components and NFs shall support TLS for security of HTTP connections.
  - ONAP shall not support HTTP for communications between ONAP components or between NFs and ONAP components, except for NF certificate enrollment over CMPv2.
- CMPv2 uses HTTP and must be allowed for certificate enrollment.
- Performance is no longer an issue and is not a valid excuse for not using TLS.
- Project impacts: VNF Requirements, VES Listener document, DCAE

# Discussion Points – May 17, 2018

## TLS

- NF Authentication
  - DCAE must be able to authenticate NF's Vendor or Service Provider X.509v3 certificate for TLS connection.
    - DCAE needs its own end-entity X.509v3 certificate.
    - DCAE needs to use CADI to authentication the NF certificate.
    - **AI: Determine** if DCAE already supports this or if there is work needed in Casablanca for this item.
  - Root CA certificate for the NF end-entity certificate must be installed in the DCAE trust store.
    - This can be done manually if the Root CA certificate is not already part of the trust store.
    - CADI can be used to manually install the Root CA certificate, but is not required.
    - Instructions for installing Root CA certificates in the trust store must be provided. Some instructions are already available on the wiki.
    - No work needed in Casablanca for this item.
  - Sub CA certificate is not required in DCAE trust store.
    - However, some Service Providers may choose to require this extra level of security in their own commercial deployments of ONAP, depending on their security policies. This topic is not for Casablanca.
    - No work needed in Casablanca for this item.

# Discussion Points – May 17, 2018

## TLS

- NF Authorization
  - CADI can be used for authorization after certificate is authenticated.
    - A list of valid Sub CA Subject names can be provisioned in the DCAE trust store and CADI can verify that the NF end-entity certificate was signed by a valid Sub CA. This is optional.
  - CADI may be too much overhead for NF authorization; it is not scalable to provision every NF instance and its permissions into CADI.
  - Authorization of NF can be achieved via NF onboarding and service instantiation processes.
    - This provides a list of VES events that the NF emits, NF instance ID, NF IP address and other information that is stored in AAI and can be used by DCAE to verify that the NF is authorized to send certain asynchronous events to DCAE. Are there DCAE impacts for this?
- DCAE Authentication by NF
  - NF must be able to authenticate the DCAE certificate for mutual TLS authentication.
  - ONAP Root CA certificate must be installed as trust anchor on NF when the DCAE end-entity certificate is signed by ONAP CA.
    - Root CA certificate can be manually pre-provisioned in NF before any TLS connection is set up.
    - NF could accept the Root CA certificate one time the first time the TLS connection was set up; for example during Plug and Play of a PNF when the PNF Registration event is sent from the NF to DCAE. What happens when NF sends the PNF Registration event a second time?
  - NF can configure TLS to accept a Root CA certificate the first time or not. Choice is left to the vendor and/or service provider, depending on its security policies.

# Discussion Points – May 17, 2018

## CA

- Assumptions
  - ONAP CA is used to sign DCAE and NF end-entity certificates during development and testing.
  - For commercial deployment, it is expected that each Service Provider has its own CA/PKI and the Service Provider Root CA/Sub CA is used to sign DCAE and NF end-entity certificates.
  - 3GPP compliant NFs use CMPv2 for certificate management; enrollment, key renewal.

## SSH/SFTP

- Authorization of ONAP access in NF
  - How does the NF authorize the ONAP components (e.g. Controller) to ensure that the access is limited to allowed operations, directories, etc. inside the NF; for example, will LDAP be supported?
  - Needs further discussion in a future meeting.



# Meeting Minutes – May 21, 2018

## Attendees

- Olaf Burdziakowski (Nokia)
- Gunner Forssell (Ericsson)
- Marge Hillis (Nokia)
- Linda Horn (Nokia)
- Thomas Ingemarsson (Ericsson)
- Samuli Kuusela (Ericsson)
- Alexander Pantus (Ericsson)
- Alex Salvarani (Nokia)
- Stephen Terrill (Ericsson)
- Maciej Wejs (Nokia)
- Amy Zwarico (AT&T)

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**Next Meeting May 24, 2018 at UTC 13:00, Eastern 8:00**

# Discussion Points – May 21, 2018

## TLS

- NF Authorization
  - NF Authorization can be achieved via NF onboarding and service instantiation processes.
    - A list of VES events that the NF emits is provided, NF instance ID, NF IP address and other information that is stored in AAI and can be used by DCAE to verify that the NF is authorized to send certain asynchronous events to DCAE.
  - The typical way for DCAE to authorize ONAP users and components is via CADI.
    - There is some concern that it is not scalable to manually provision every NF instance and its roles and permissions into CADI prior to the first NF TLS connection into ONAP.
    - Can we provision NF roles, permissions and instances into CADI automatically at onboarding and service instantiation time?
      - At onboarding, NF provides artifacts with list of events the NF emits. A role could be created in CADI per NF Type with permissions that include sending these VES events to DCAE. What projects are impacted for this; SDC, AAF?
      - At instantiation, the unique NF instance ID becomes known. This “user” could be added to CADI and assigned to the role created at onboarding. SO workflow and/or DCAE would need to include updating CADI. What projects are impacted for this; AAF, SO, DCAE?
      - What is the “user” for a NF? UUID? NF Name in AAI? Choice determines when CADI must be updated; e.g. instantiation, restart, SW upgrade.
  - **AI: AAF team** to identify what information is needed for CADI to authorize a NF and what can be automated.

# Discussion Points – May 21, 2018

## TLS

- NF Authorization (continued)
  - Could we use Pluggable Authentication to authorize NFs instead of CADI?
    - CADI would be configured to point back to DCAE for authorization.
  - Need to consider the complexity of the authorization solution to:
    - DCAE
    - Onboarding process
    - Instantiation process
    - Service Provider
  - Need to consider the automation of the solution:
    - We can not have manual steps at run time (during instantiation) and that is the first time ONAP knows the NF instance ID (user)
    - We could tolerate manual steps at design time.
  - Need to consider how we could phase the final “ideal” solution over time if it can’t all be completed in Casablanca.
    - Identify some steps that make sense.

# Discussion Points – May 21, 2018

## TLS

- DCAE Authentication by NF
  - NF must be able to authenticate the DCAE certificate for mutual TLS authentication.
  - If DCAE and NF certificate are signed by the same CA (ONAP or Service Provider (SP) CA) then there is no problem.
  - If NF certificate is signed by Vendor Factory CA and DCAE certificate is signed by ONAP/SP CA, then ONAP/SP Root CA certificate must be in NF trust store.
    - ONAP/SP Root CA certificate can be manually pre-provisioned in NF before any TLS connection is set up. But this does not work for Plug and Play (PnP) of PNFs.
    - NF could accept the Root CA certificate one time the first time the TLS connection was set up; for example during PNF PnP when the PNF Registration event is sent from the NF to DCAE.
      - What happens when NF sends the PNF Registration event a second time? Is the Root CA certificate still valid?
      - NF can configure TLS to accept a Root CA certificate the first time or not. Choice is left to the vendor and/or service provider, depending on its security policies.
  - To avoid this situation, ONAP could require that NFs perform operator certificate enrollment before the first TLS connection.
  - **AI: Check SOL002 and SOL004 to see if this problem has already been solved.**

# Discussion Points – May 21, 2018

## SSH/SFTP

- Authorization of ONAP access in NF
  - How does the NF authorize the ONAP components (e.g. Controller) to ensure that the access is limited to allowed operations, directories, etc. inside the NF?
  - LDAP is the 3GPP standard according to TS 33.310.
    - Many Service Providers have LDAP systems in place.
  - However, LDAP is difficult to manage and the world is moving away from it to simpler protocols.
    - Consider HTTP Server as an alternative.
    - 3GPP standard needs to be updated and/or softened with regard to LDAP.
- VNF Requirements do not specify what protocols must be supported for Identity and Access Management (IDAM).
  - **AI: Propose** protocols for IDAM to Amy Zwarico.
  - Consider what vendors and service providers currently support as well as where the industry is heading.
  - LDAP should be one of the supported protocols to support legacy systems.

# Discussion Points – May 21, 2018

## Certificate chaining

- Recommend that ONAP components and NFs support 3 levels of certificate chaining; Root CA, Sub CA, End-entity. This is already supported in ONAP.
- No work needed in Casablanca for this item.

## VNF Certificates

- Need a scenario specified for how and when VNFs get their certificates.
  - Must happen before the first TLS connection.
  - What is used as the CN? Choice of CN determines when a new certificate is needed.
    - If it is UUID, then a new certificate is needed every time VNF is restarted or SW upgraded. Certificate enrollment must be part of instantiation.
    - If it is VNF Name, then the certificate must be persistently stored over VNF restart and SW upgrade.