



# Welcome to the World of Standards



## **SOFTWARE IN RADIO AND SOFTWARE-DEFINED RADIOS – TECHNOLOGY AND DECLARATION OF CONFORMITY**

**53 shades of RE-D: how to place compliant radio equipment on the European market – ETSI,  
Sophia Antipolis, November 4<sup>th</sup>, 2015**

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Motivation

Software Reconfiguration in Mobile Devices

Scenarios for Declaration of Conformity in  
the context of Software Reconfiguration

Next Steps & Conclusions



## I. Motivation

- **Radio Equipment Directive introduced new paragraphs on Software Reconfiguration:**
  - **Article 3 - Essential requirements**
    - 3. Radio equipment within certain categories or classes shall be so constructed that it complies with the following essential requirements:
      - (i) radio equipment supports certain features in order to ensure that **software can only be loaded into the radio equipment** where the **compliance of the combination of the radio equipment and software** has been demonstrated.
  - **Article 4 - Provision of information on the compliance of combinations of radio equipment and software**
    - 1. Manufacturers of radio equipment and of **software** allowing radio equipment to be used as intended shall provide the Member States and the Commission with information on the **compliance of intended combinations of radio equipment and software** with the essential requirements set out in Article 3. .... Depending on the specific **combinations of radio equipment and software**, the information shall precisely identify the radio equipment and the software which have been assessed, and it shall be continuously updated.
    - 2. The Commission shall be empowered to adopt **delegated acts** in accordance with Article 44 specifying which **categories or classes of radio equipment** are concerned by the requirement set out in paragraph 1 of this Article.
    - 3. The Commission shall adopt **implementing acts** laying down the operational rules ...

- However, *Software Defined Radio* Technology failed to be successful in commercial mass-market products...

- Why do we think that it will work this time ?

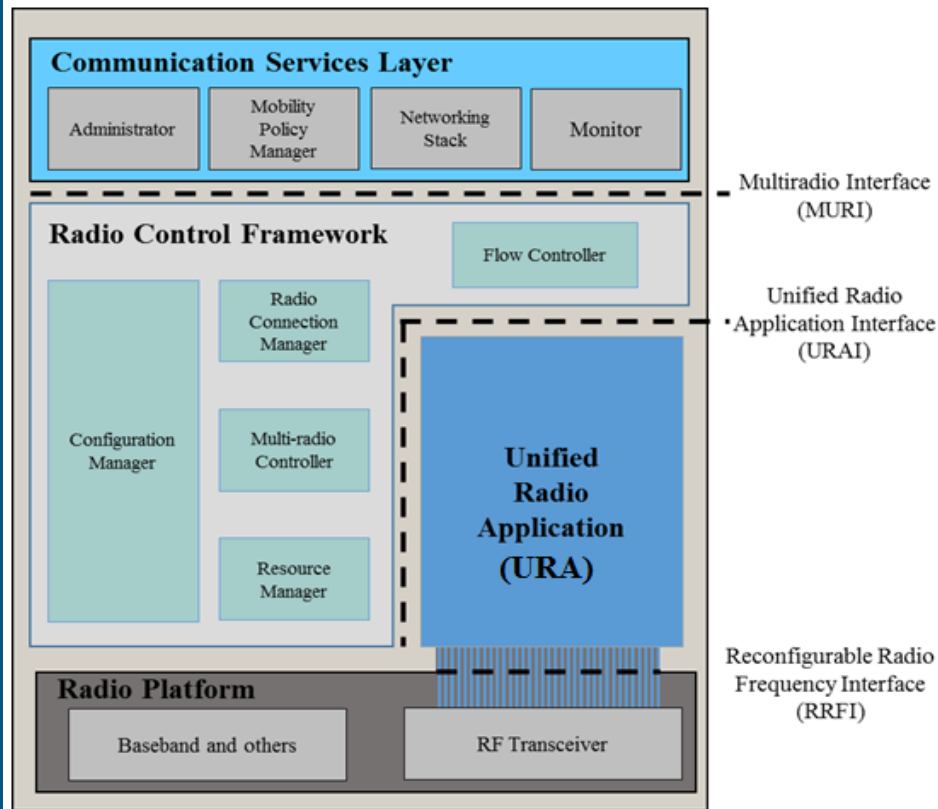


- What will we do differently ?
  - SDR Technology mainly addressed Software Reconfiguration from a computer architecture perspective
  - We address the problem „from the other end“
    - Extend „Smartphone Apps“ to modify radio parameters
    - Secure execution environment controls access to APIs

## ■ II. Software Reconfiguration Mobile Devices

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✓ **Multiradio Interface (MURI) between CSL and RCF**

- Administrative Services
- Access Control Services
- Data Flow Services

✓ **Unified Radio Application Interface (URAI) between RCF and URA**

- Radio Application Management Services
- User Data Flow Services
- Multiradio Control Services
- Resource Management Services
- Parameter Administration Services

✓ **Reconfigurable Radio Frequency Interface (RRFI) between URA and RF Transceiver**

- Spectrum Control services
- Power Control services
- Antenna Management services
- Tx/Rx Chain Control services
- RVM Protection services

<Reconfigurable Radio System : Radio Computer>

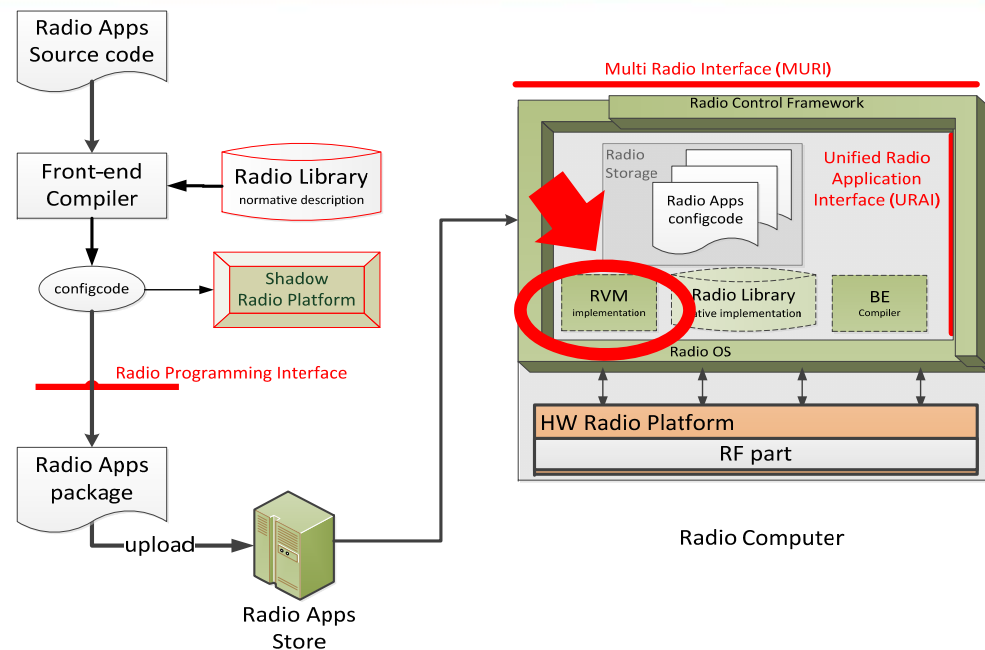
ETSI EN 303 095: Radio Reconfiguration related Architecture for Mobile Devices

# Radio Virtual Machine – A Secure Environment



## ETSI EN 303 095:

- Architecture Definition of Software Reconfiguration capable Mobile Devices.
- Key novelty: **A Radio Virtual Machine (RVM)** provides a secure Software execution environment limiting access to Radio Parameters for Software Components.
- EN 303 095 furthermore introduces the concept of „**RVM protection classes**“. A SW manufacturer is offered a trade-off between choosing a high (low) level of flexibility corresponding to a low (high) RVM protection class and thus requiring a full (limited) joint Hardware / Software verification process for new SW Components.
  - Example: An RVM class only granting access to antenna selection features (i.e., no TX power change, etc.) to SW Components will require a reduced set of test cases to be executed when a new SW Component is made available compared to a fully open platform in order to validate its compliance to the essential requirements.



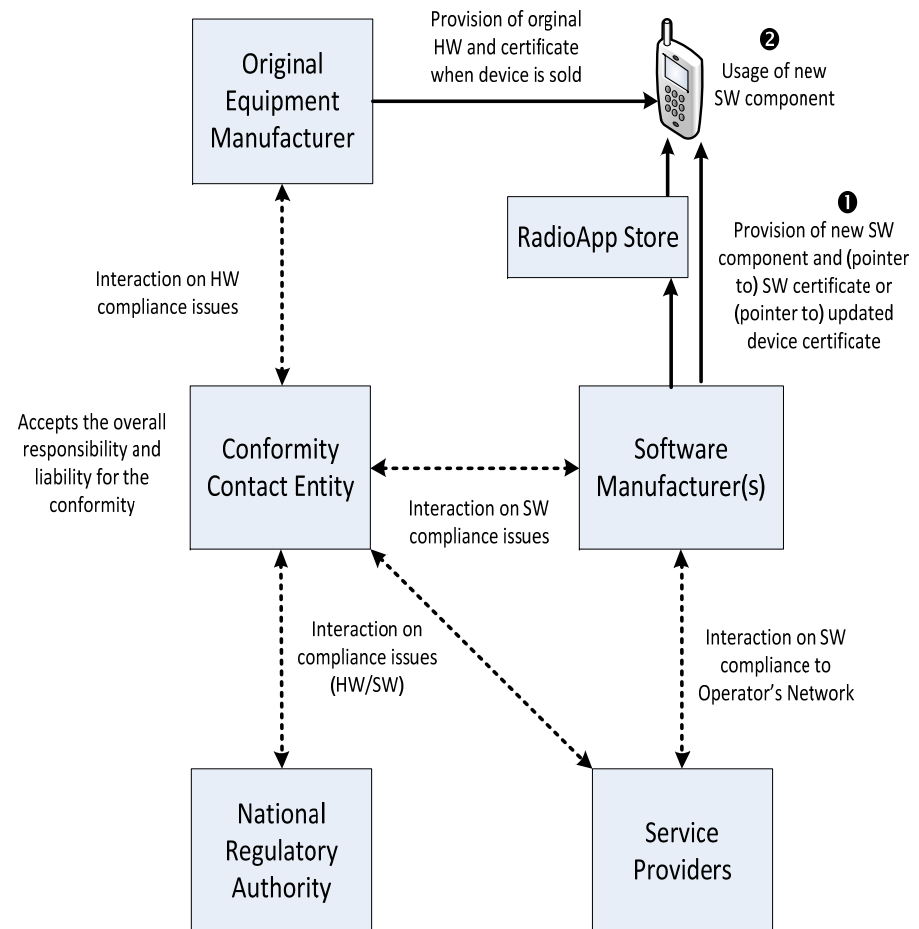
ETSI EN 303 095: System architecture



## **III. Scenarios for Declaration of Conformity in the context of Software Reconfiguration**

## Related ETSI Activities: ETSI TR 102 967

- Definition of Key Use Cases, related Stakeholders and Information flow;
- Proposal of Scenarios for Declaration of Conformity;
- Proposal of a Responsibility Chain in the context of Software Configuration through RadioApps.

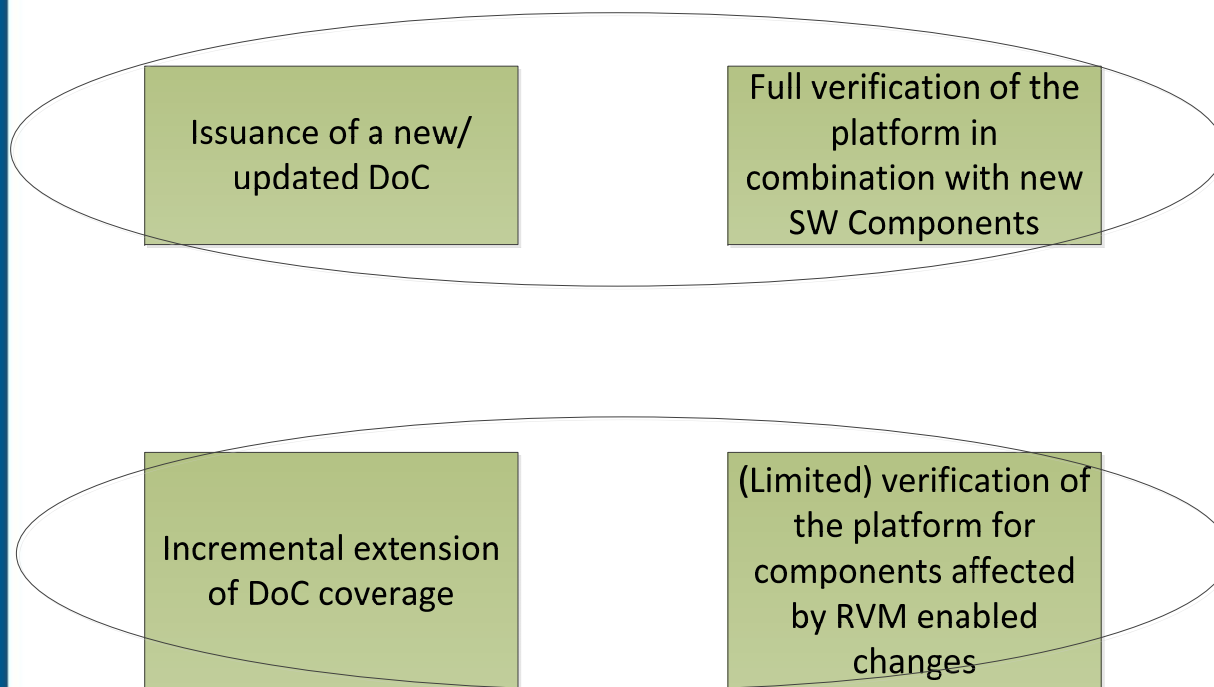


- ETSI currently discusses two Potential Scenarios for Declaration of Conformity in the context of a revision of TR 102 967 in the context of a global application – depending on the applicable legal framework.
- **Potential Scenario 1:** Update of the applicable Declaration of Conformity for the joint operation of Hardware in combination with a new Software Component (RadioApp).
  - In the European context, it is proposed to build on *Radio Equipment Directive, Annex VII: SIMPLIFIED EU DECLARATION OF CONFORMITY*;
  - Initially, the Original Equipment Manufacturer „declares that the radio equipment type [designation of type of radio equipment] is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity Declaration of Conformity is available at the following internet address:\_\_\_\_\_”;
  - In order to enable to joint operation of the available Hardware in combination with a new Software Component (RadioApp), the Declaration of Conformity available at the given Internet Address is updated including the new configuration.

# Scenarios for Declaration of Conformity



- **Beyond Potential Scenario 1, ETSI TC RRS is discussing whether the Declaration of Conformity approach can be handled at lower complexity for platforms with restricted access to Radio Parameters – as illustrated below on the right hand side:**



Scenario 1 (**full complexity of verification & DoC**): Full verification of the platform in combination with a new DoC being issued.

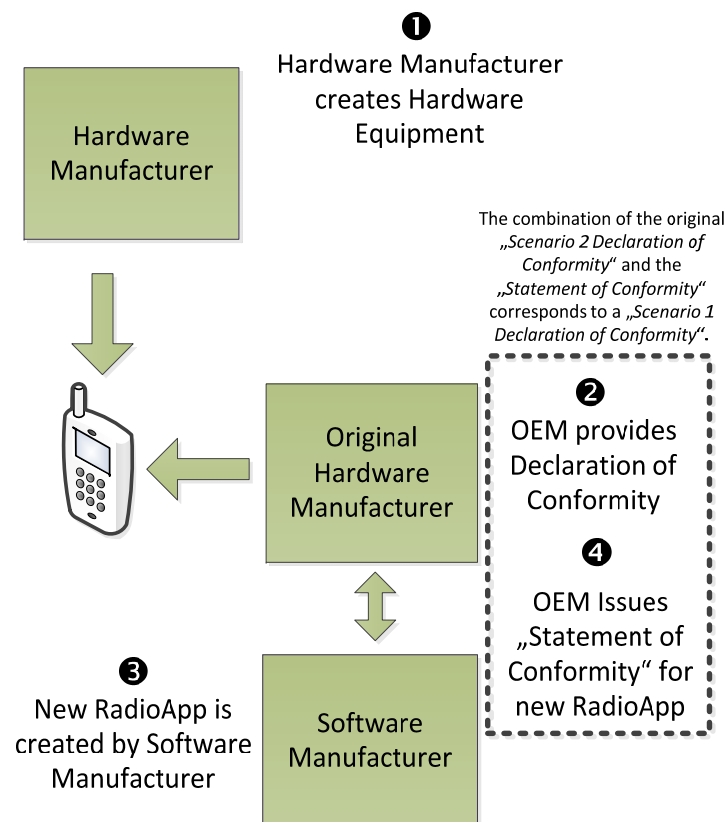
Scenario 2 (**reduced complexity of verification & DoC**): Verification of the platform for components affected by RVM enabled changes in combination with an incremental extension of DoC coverage.

**Two Scenarios for DoC - both of identical level of confidence**

# Scenarios for Declaration of Conformity



- **Potential Scenario 2:** Initially, a DoC is issued for available hardware components in combination with Software Components (RadioApps) to be developed in the future.
- A future software component is typically made available together with a “Conformity Statement” by the Original Equipment Manufacturer, indicating that the combination of concerned hardware and software complies with the appropriate requirements.
- The initial DoC will be not modified, the **Conformity Statement** is related to the features enabled by RVM limiting software components’ access to radio parameters as defined by EN 303 095 concept of „RVM protection classes“.
- In Scenario 2, the Declaration of Conformity together with the appropriate Conformity Statement is expected to be equivalent to a Scenario 1 - the overall responsibility is taken by a single entity, i.e. the Original Equipment Manufacturer (OEM)



### **IV. Next Steps and Conclusions**

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- **ETSI will further develop deliverables enabling the introduction of Software Reconfiguration features to Radio Equipment**
  - A second deliverable is currently in preparation: TS 103 094 defines Requirements for the introduction of Software Reconfiguration features to Radio Equipment.
- **Regulation framework is expected to be clarified – TCAM announced creation of corresponding group**