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# The Importance of APIs for Certification of SCA Radios

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## ❖ The Software Communications Architecture (SCA)

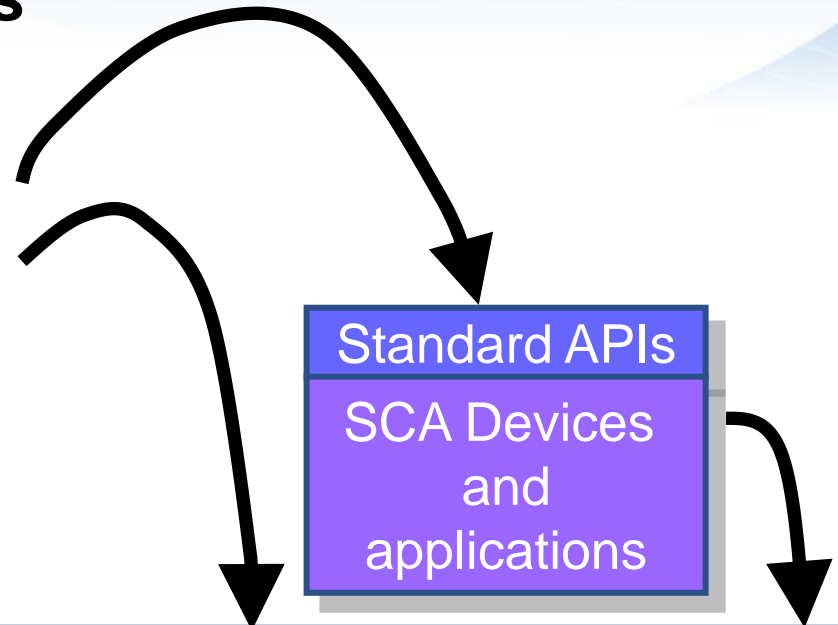
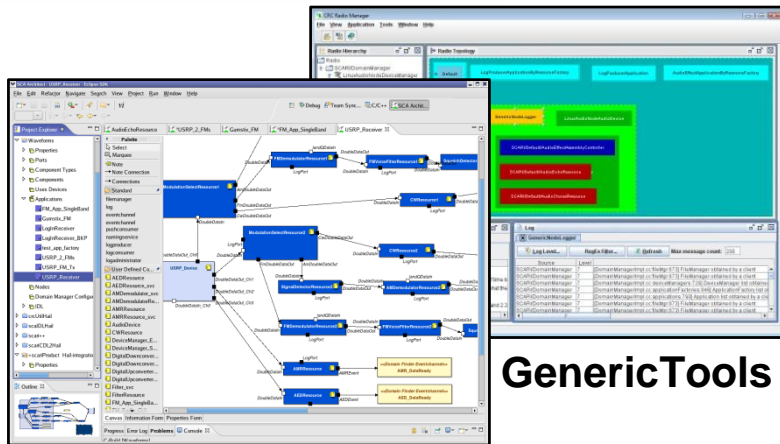
### ❖ Compliance

- SCA compliance
- Domain-specific API compliance

### ❖ Conclusion

- ❖ **The Software Communications Architecture (SCA) is mainly used for the creation of military Software Defined Radios (SDRs)**
  - The SCA was created for the US DoD Joint Tactical Radio System (JTRS) program
  
- ❖ **However, the SCA standardizes generic features of software defined embedded systems**
  - The installation process for applications
  - The deployment of applications on heterogeneous distributed platforms
  - The control of applications
  - Introspection, health status monitoring

- ❖ **Standardizing APIs for common features enables the use of generic tools**

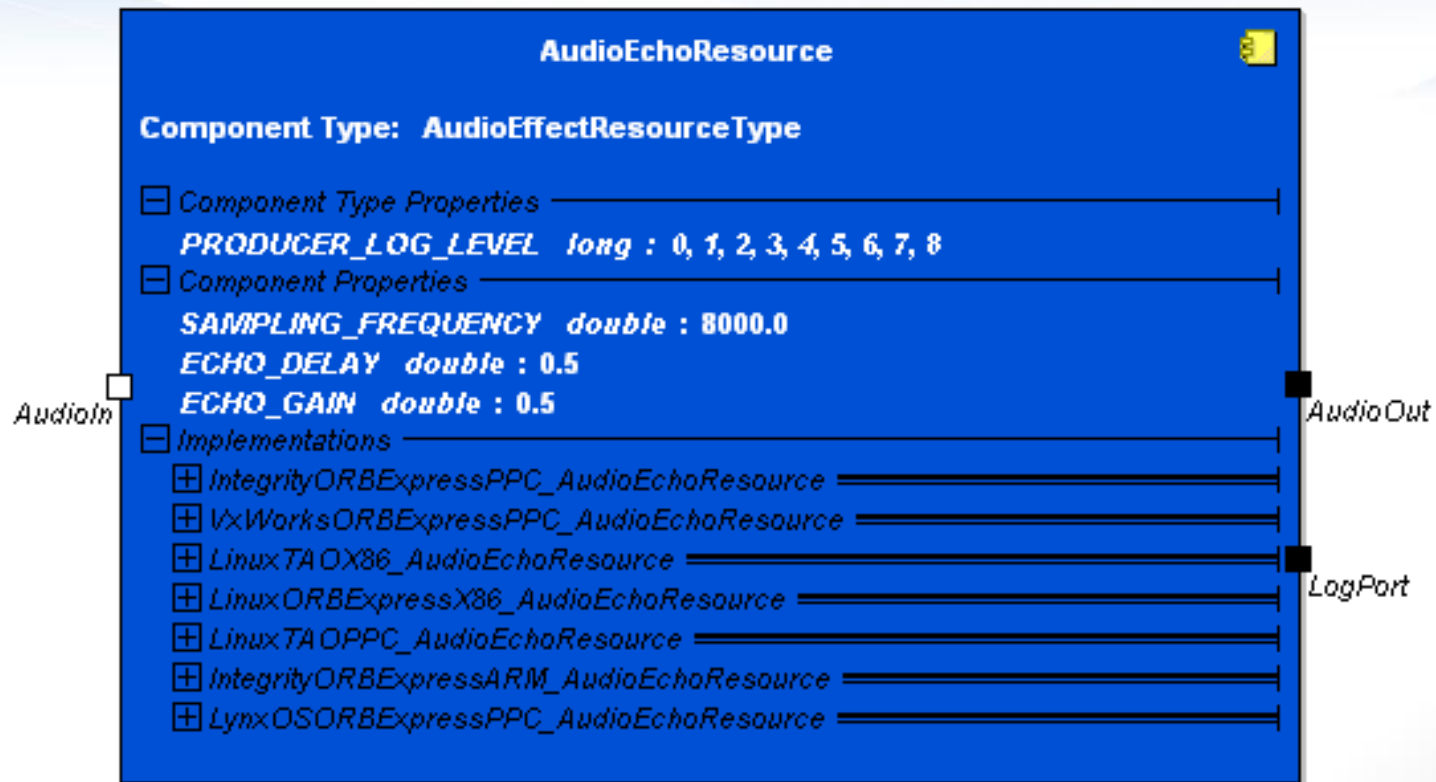


- ❖ **The SCA also helps make application source code more portable**
  - **Defines a standard for modeling software components and assemblies (Component-Based Development)**
    - Better documentation leads to better portability
  - **Imposes a standard for system calls used in applications (SCA POSIX AEP)**
    - Makes source code more portable across different operating systems
  - **Imposes a standard for communications between software components (CORBA & MHAL)**
    - Developers don't deal with transports directly

- ❖ From a software development perspective, the SCA is a Component-Based Development architecture
- ❖ **What is Component-Based Development ?**
  - CBD is a development paradigm where the smallest unit of software is a component
  - With CBD, an application is ‘assembled’ using software components much like a board is populated with hardware components

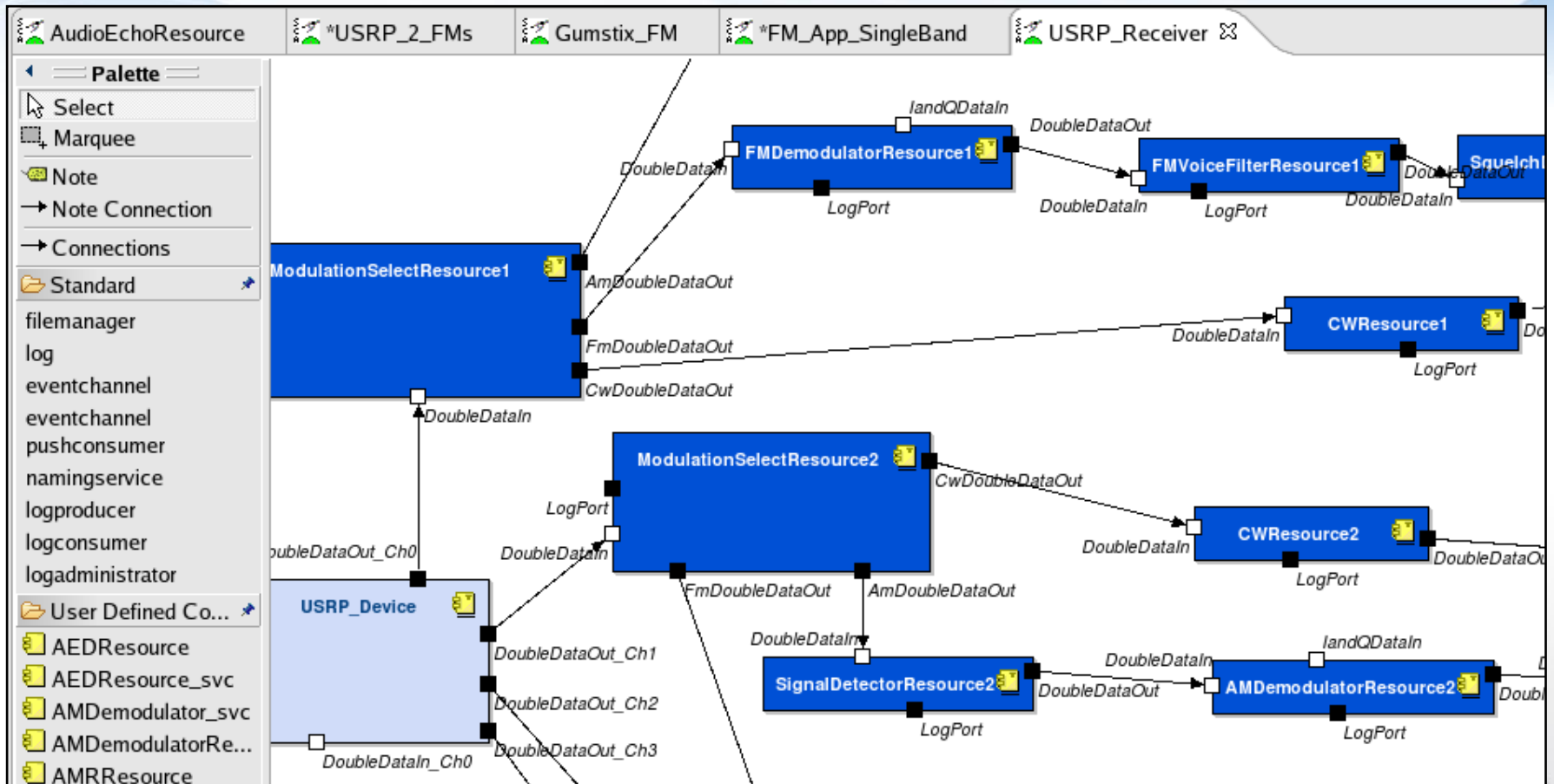
- ❖ **CBD promotes the COTS culture and is enabling the industrialization of software**
  
- ❖ **The goal is to apply the hardware development paradigm to software**
  - Purchase software components from a 'spec-sheet' catalog
    - Describe how to influence behavior (config properties)
    - Describe how to interface (ports)
    - Describe resource consumption (capacity properties)
    - Describe resource requirements (capability properties)

## Graphical representation for a software component model

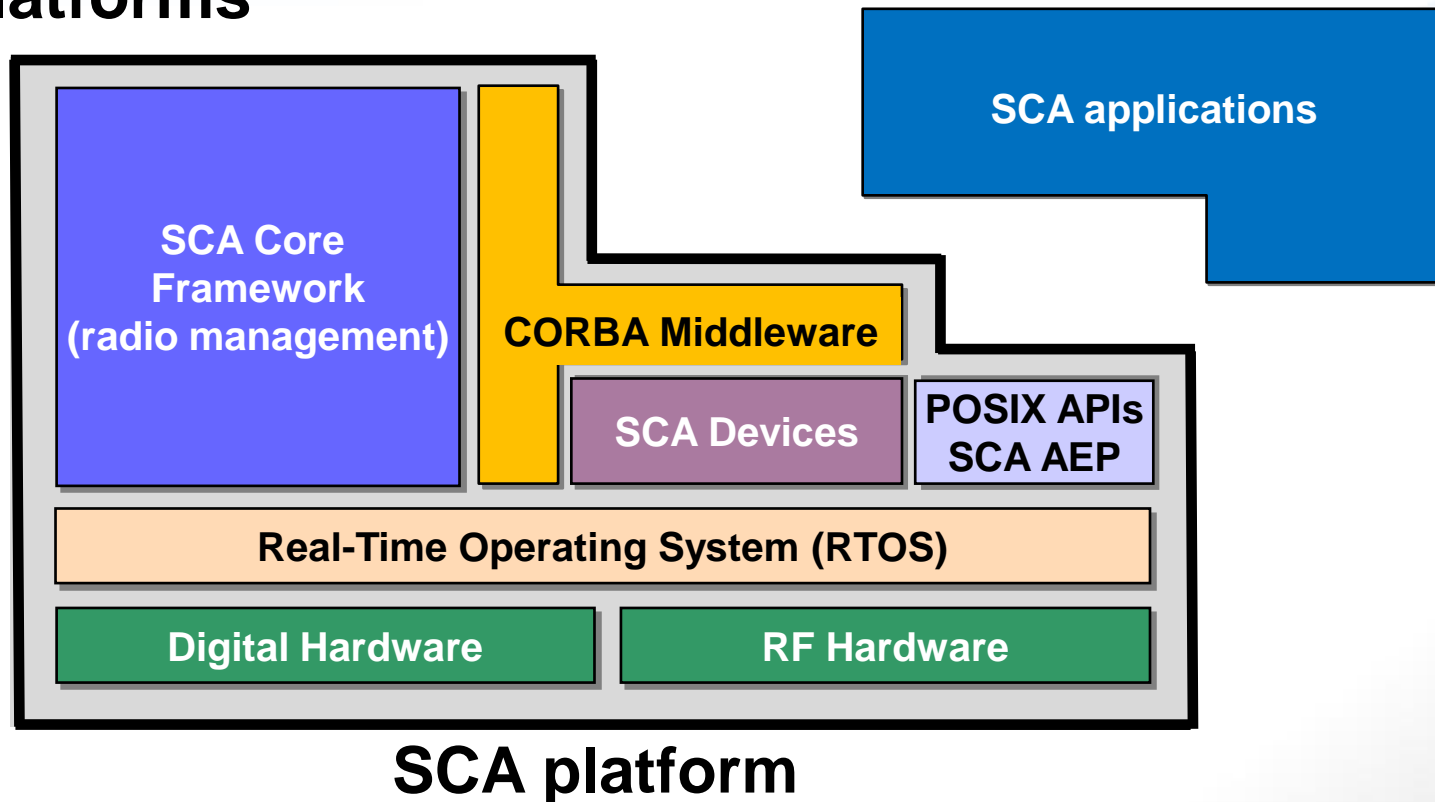




## Graphical representation for an assembly of software components



- ❖ The goal of the SCA is to allow applications to be quickly ported across different SCA compliant platforms

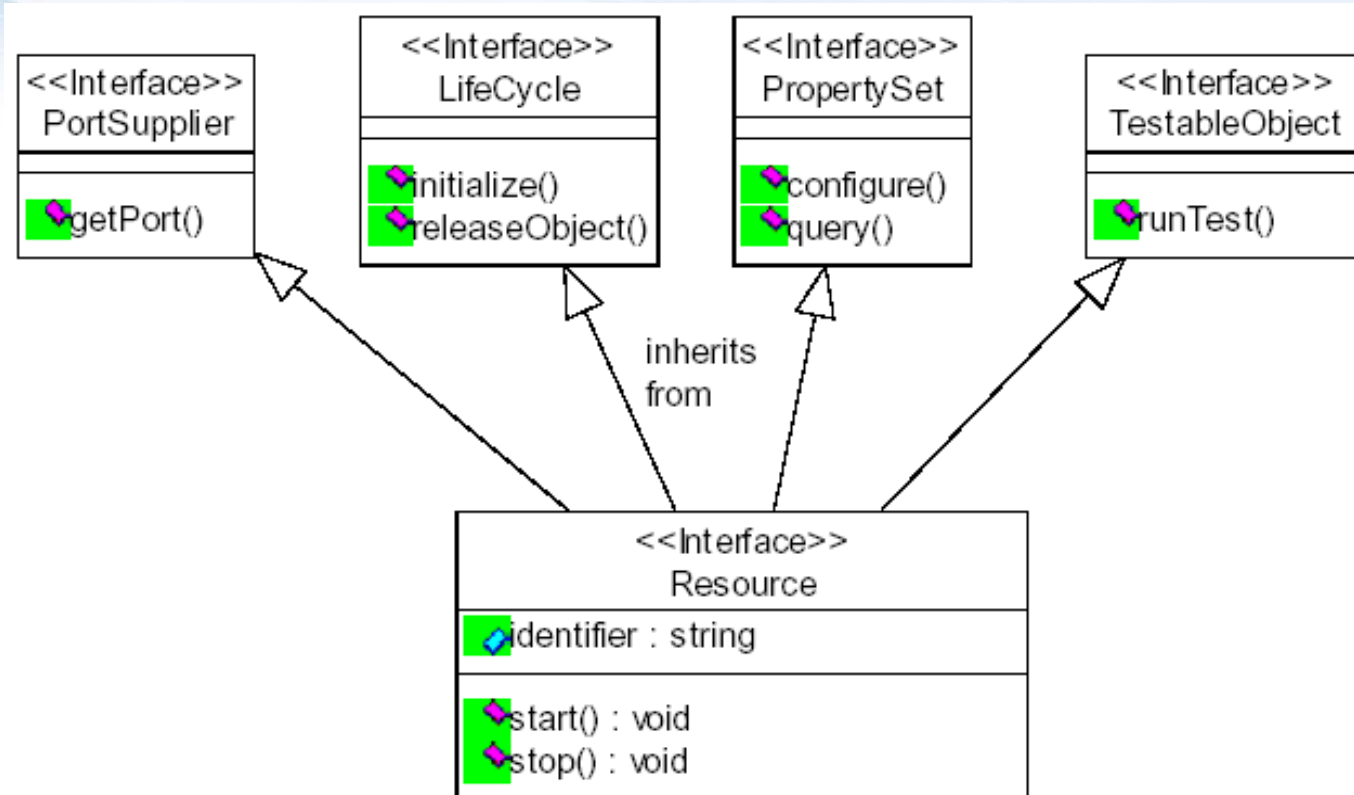


- ❖ **The Software Communications Architecture (SCA)**
  
- ❖ **Compliance**
  - **SCA compliance**
  - **Domain-specific API compliance**
  
- ❖ **Conclusion**

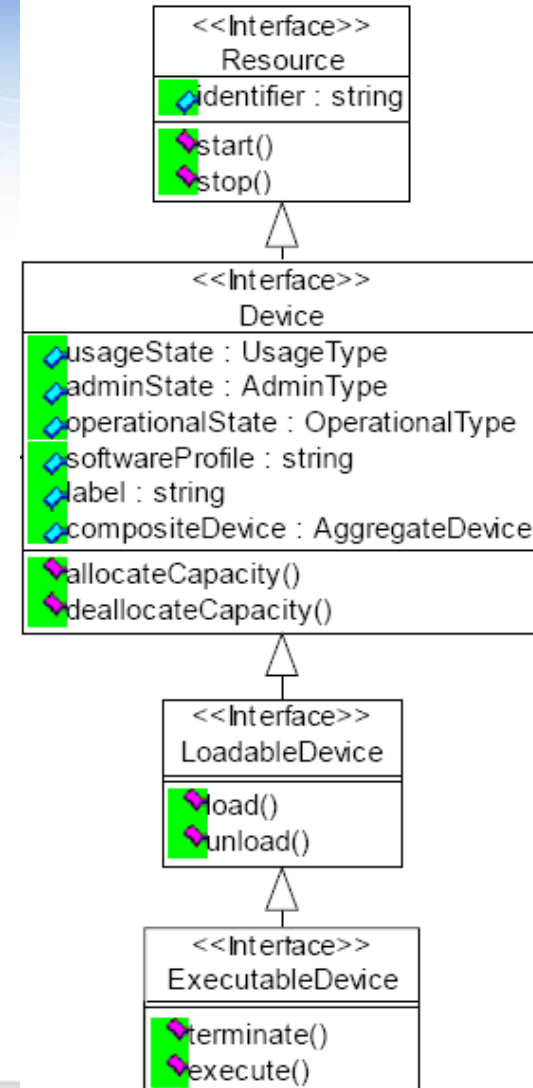
- ❖ **The certification of an SCA system can be viewed as a two-step process**
  - First Step: SCA Compliance
  - Second Step: Domain-Specific API compliance
- ❖ **SCA compliance only deals with the “Deployment and Configuration” aspect of software components**
- ❖ **Domain-specific API compliance deals with the APIs provided by the SCA Devices of a platform which are used by SCA Applications**

- ❖ **The SCA specification document only defines APIs for Deployment and Configuration (D+C)**
  - The D+C is a process by which software is deployed onto processing elements (GPP, DSP, FPGA) of a platform
  - The D+C abstracts all types of processing elements using two type of SCA Devices: `LoadableDevice` and `ExecutableDevice`
  - The D+C standardizes how software components are initialized, released, started, stopped, interconnected, configured, queried

## ❖ SCA D+C Standard APIs for Application components:



## ❖ SCA D+C Standard APIs for Platform Components:



- ❖ **SCA compliance for an *application* means it has to meet the D+C requirements:**
  - It comes with the proper description files (XML domain profile)
  - It only uses system calls allowed by the SCA POSIX AEP specification
  - It uses minimum CORBA and/or MHAL for communications between software components
  - It meets a number of SCA Core Framework requirements
    - Support standard input arguments, Provide standard properties, etc.

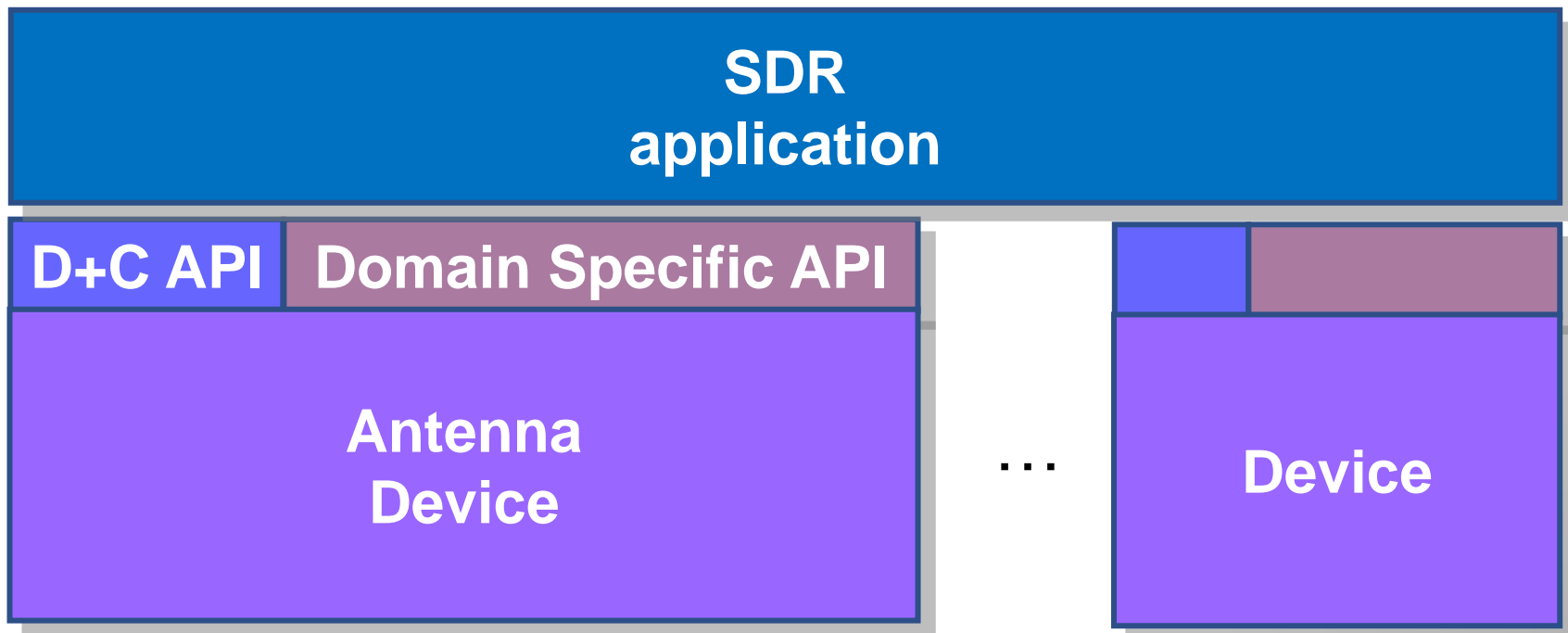


- ❖ **SCA compliance for a *platform* means it has to meet the D+C requirements:**
  - It meets the D+C requirements
  - It provides the system calls defined in the SCA AEP POSIX specification
  - It provides minimum CORBA and possibly MHAL support
  - It provides an SCA Core Framework
  - It provides at least one SCA ExecutableDevice which is used to deploy the software components of an application
  - Each SCA Device comes with the proper description files (XML domain profile)

- ❖ **The Software Communications Architecture (SCA)**
  
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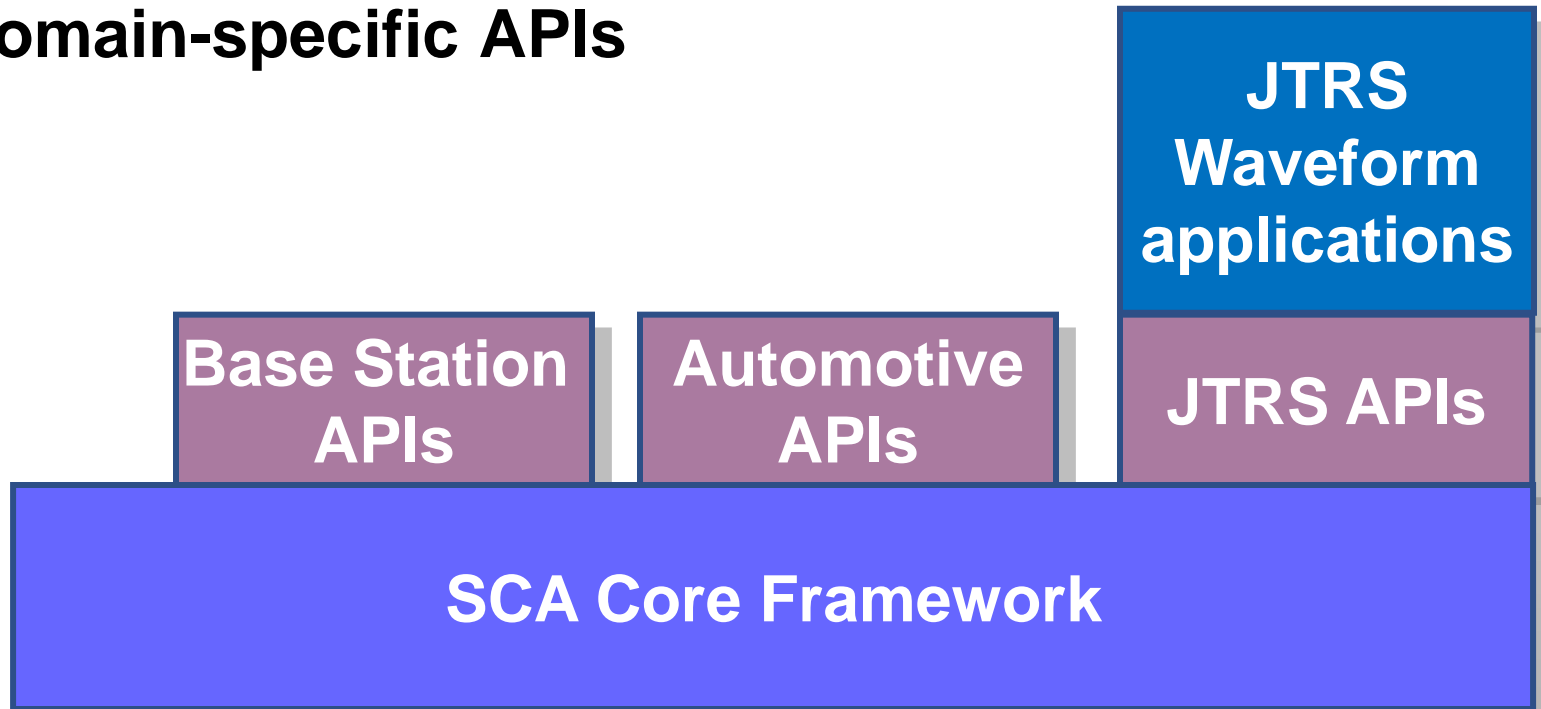
# Domain-Specific API Compliance

- ❖ **Domain-specific APIs are essential for application portability**
  - An application cannot easily be ported to platforms that don't provide the required domain-specific APIs



# Domain-Specific API Compliance

- ❖ The SCA is independent of the application domain
- ❖ Different domains are supported by domain-specific APIs



- ❖ **The Joint Program Executive Office (JPEO) has released a number of domain-specific APIs:**
  - The “JPEO JTRS Standards APIs” fall under two category: basic and complex APIs
  - The complex APIs are made of basic APIs. Here is the list of the complex APIs:

AudioPortDeviceApi	MhalApi
EthernetDeviceApi	SerialPortDeviceApi
FrequencyReferenceDeviceApi	TimingServiceApi
GpsDeviceApi	VocoderServiceApi

- ❖ **The OMG “Software-Based Communication (SBC)” Domain Task Force (DTF) has also released a number of models that can be used to define radio-specific APIs**
  - Timing, Serial IO, Audio, Antenna, etc.
- ❖ **The SDR Forum “Transceiver Subsystem Interfaces Task Group” is working in a new API**
  - Transceiver API has been submitted

❖ **The SDR Forum “Antenna API Task Group” has worked on a set of APIs for different types of Antennas**

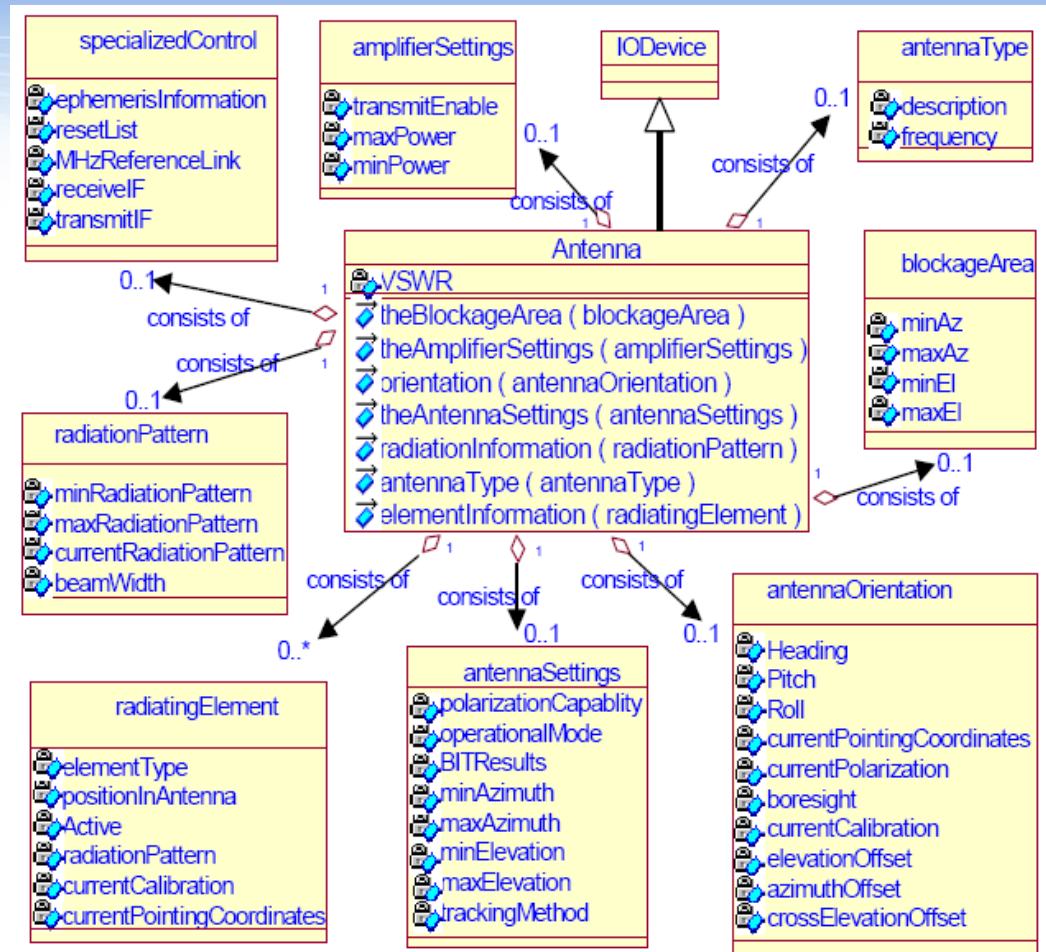


Figure 14: Antenna Command and Control UML diagram

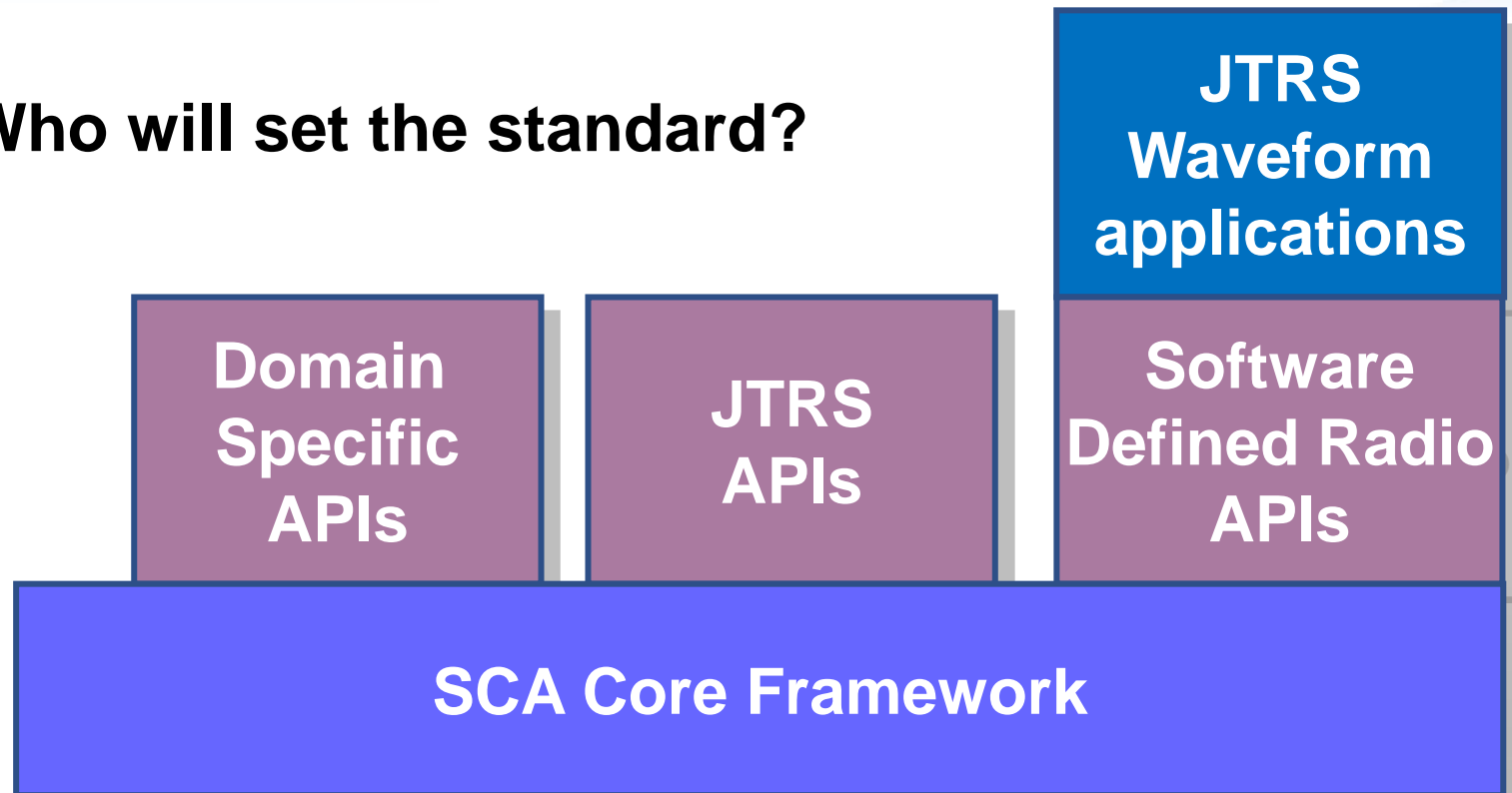
- ❖ **The Software Communications Architecture (SCA)**
  
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- ❖ **Compliance is a two step process:**
  - SCA-compliance
  - Domain-specific API compliance
  
- ❖ **SCA compliance is independent of a specific application domain**
  - The JPEO relies on a number of tools (JTAP, WTT, DRP) and manual inspection for SCA-compliance
  
- ❖ **No single organization offers a comprehensive set of radio-specific APIs**
  - Immaturity and lack of APIs leads to the use of proprietary APIs which affects portability

- ❖ **The next big step for Software Defined Radios is the standardization of radio-specific APIs**
  - Will bring application portability to another level

- ❖ **Who will set the standard?**



# Questions?

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