

**AERONAUTICAL TELECOMMUNICATIONS NETWORK PANEL**

**WORKING GROUP 3 (APPLICATIONS AND UPPER LAYERS)**

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**Proposed PDUs for Package 2 CM Server Considerations**

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**SUMMARY**

This paper presents some new PDUs which will take advantage of the extensibility features of ASN.1 in order to accommodate the CM server concept.

## 1. Introduction

This paper gives a discussion of some options for additional PDUs to accommodate a more advanced CM server concept. In addition, some changes need to be made to Sub-volume 1, adding the definitions of the CM server concept. The following definitions are proposed to be added to Sub-volume 1:

**CM Server:** An ATS facility that is capable of providing application information relating to other ASTUs to requesting aircraft or ATSUs.

**Application Information:** Refers to the application names (e.g. ADS, CPDLC), version numbers, and addresses (the long or short TSAP, as required) of each applications. If no applications are supported or the application information is not available, then the application information field will be null.

## 2. Discussion

The CM server concept (an aircraft being able to specify multiple facilities from which it wishes to have data link services) has evolved as operational use of CM has been further studied. Without additional user requirements and possible changes to the SARPs, a CM server (as currently envisioned) cannot be fully realized. If this is done in the Package 1 SARPs, there is the danger that the SARPs may be sufficiently destabilized which will cause problems with current trials and implementations, as well as incur negative perceptions (i.e. the SARPs will never be baselined, they are non-interoperable with current trials, etc). Therefore, another solution would be to make use of the extensibility markers in the aircraft and ground-generated message sections of the CM ASN.1. There would also need to be extensive changes to the protocol in order to allow for this capability. The upside is that backwards compatibility is preserved.

One possible change would be the addition of three new messages, one air-generated and two ground-generated. These are described as follows:

Aircraft-generated Messages:

**CMServerLogonRequest** - used by an aircraft in the case of a known CM server; can specify application information requests for up to four different facilities. If a CM ground system is not a CM server configuration, it can respond with a server not supported message, much like a CM facility that does not support ground forwarding. The CMServerLogonRequest does not allow an aircraft to request individual applications, but only application information that is available at that facility. The aircraft user must then decide which information to use or not use. Note that number four was chosen in order to allow an aircraft to request the information for the current controlling CPDLC facility, the downstream CPDLC facility, a local FIS facility, and an en route/remote FIS facility. This number is open to discussion. Another facet that needs clarification is whether the CM server is required to forward information to the appropriate ground systems that are in the

CMServerLogonRequest, and whether an indication of success/no success for forwarding is needed by the aircraft (I would say no, it's not needed). If the information received in the CMServerLogonRequest is to be forwarded, the ground system will need to format the CMForwardRequest properly, since it will not be the same as the CMLogonRequest (will probably call for new ASN.1 for ground forwarding).

Ground-generated Messages:

**CMServerLogonResponse** - used by a ground system to respond to a CMServerLogonRequest. Can either return a service unavailable message if a CM end system does not store other facilities' information, a server unavailable if the capability exists but is not in operation due to temporary circumstances such as maintenance, or it may return the application information for the requested facilities.

**CMServerUpdate** - Used for either a server or single CM end system configuration. Using this message, a ground system can send an update to an aircraft with up to four sets of facility application information. This message is basically the same in format as the CMServerLogonResponse, but without the option of sending the InfoUnavailable element. The CMServerUpdate will facilitate a ground system keeping a dialogue in place while sending multiple facilities' information.

The following section further outlines the messages' ASN.1 and time-sequence diagrams, and outlines what the protocol changes would entail.

### 3. Proposed ASN.1

After the extensibility marker in **CMAircraftMessage**, add:

```
cmServerLogonRequest    [3]    CMServerLogonRequest,  
...
```

After the extensibility marker in **CMGroundMessage**, add:

```
cmServerLogonResponse   [6]    CMServerLogonResponse,  
cmServerUpdate          [7]    CMServerUpdate,  
...
```

The rest of the ASN.1 is presented in logical order, not as it would appear when actually inserted into the ASN.1 in the SARPs (i.e. alphabetical order), in order to improve comprehension.

**CMServerLogonRequest ::= SEQUENCE**

```
{  
  aircraftFlightIdentification    [0]    AircraftFlightIdentification,  
  cMLongTSAP                     [1]    LongTsap,
```

groundInitiatedApplications	[2]	SEQUENCE SIZE (1..256) OF
AEQualifierVersionAddress OPTIONAL,		
airOnlyInitiatedApplications	[3]	SEQUENCE SIZE (1..256) OF
AEQualifierVersion OPTIONAL,		
requestedFacilities	[4]	SEQUENCE (1..4) OF
FacilityDesignation,		
airportDeparture	[5]	Airport OPTIONAL,
airportDestination	[6]	Airport OPTIONAL,
dateTimeDepartureETD	[7]	DateTime OPTIONAL,
...		
}		

**CMServerLogonResponse ::= CHOICE**

{		
infoUnavailable	[0]	InfoUnavailable,
requestedInfo	[1]	SEQUENCE SIZE (1..4) OF
RequestedInfo,		
...		
}		

**InfoUnavailable ::= ENUMERATED**

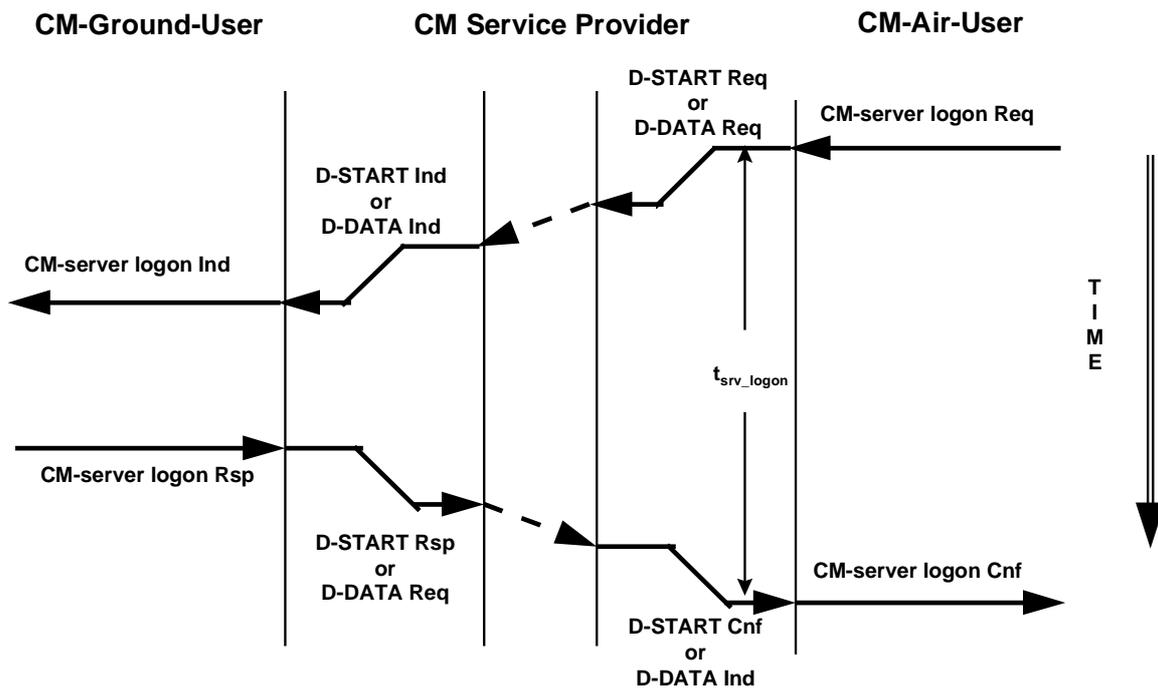
{		
serverNotSupported	(0),	
serverUnavailable	(1),	
...		
}		

**RequestedInfo ::= SEQUENCE**

{		
facilityDesignation	[0]	FacilityDesignation,
cMLongTSAP	[1]	LongTsap OPTIONAL,
airInitiatedApplications	[2]	SEQUENCE SIZE (1..256) OF
AEQualifierVersionAddress OPTIONAL,		
groundOnlyInitiatedApplications	[3]	SEQUENCE SIZE (1..256) OF
AEQualifierVersion OPTIONAL,		
...		
}		

**CMServerUpdate ::= SEQUENCE SIZE (1..4) of RequestedInfo**

Time Sequence Diagram for CM-server logon service:

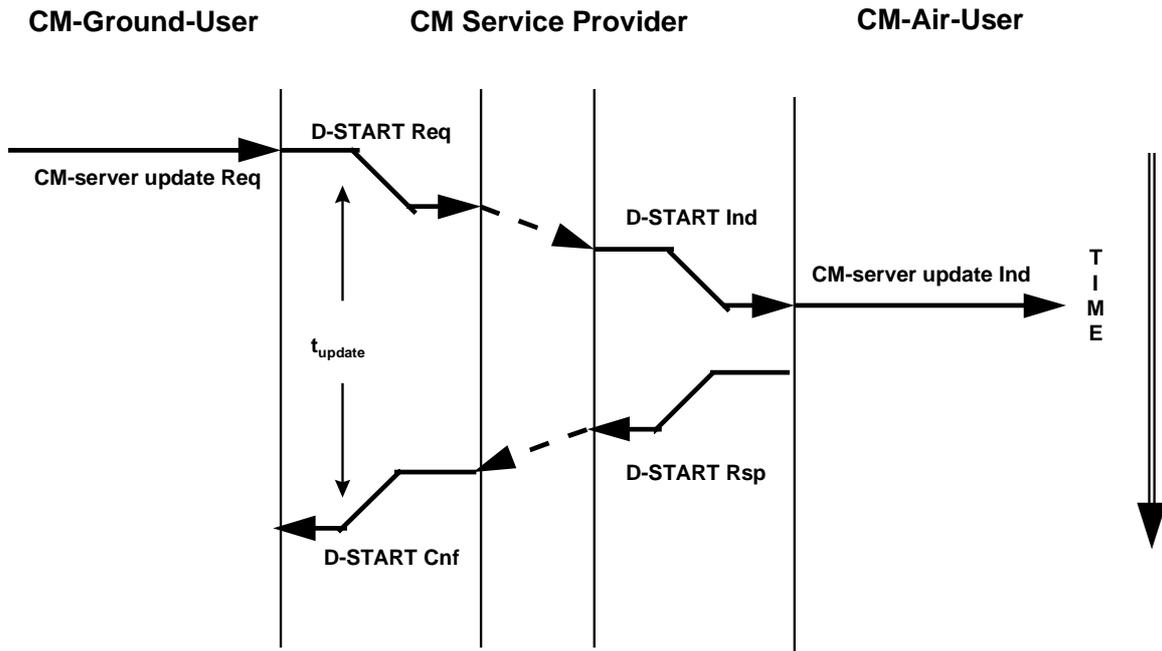


Note that a CM-logon is assumed to have been performed, so there is no version negotiation. The rationale for this is to prevent a situation where this service is attempted with a version 1 CM, which would cause an abort. Therefore, additional user requirements are needed to ensure that a CM-logon service is performed before attempting a CM-server logon. Also note that there is a new timer value,  $t_{srv\_logon}$ . This is due to a possible increase in data base query time of the server. The value of this timer, and whether or not it is really needed (i.e. if the regular  $t_{logon}$  value can be used) needs to be determined. The primitives and parameters are listed below, as they would appear in section three. This service can be done with or without an existing dialogue.

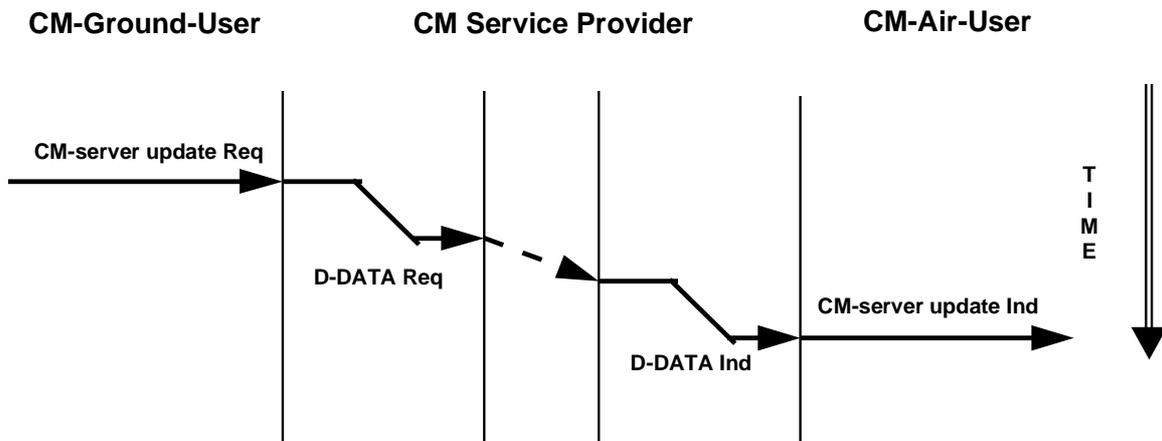
Parameter Name	Req	Ind	Rsp	Cnf
ICAO Facility Designation	M			
Aircraft Address	M	M(=)		
Server Logon Request	M	M(=)		
Server Logon Response			M	M(=)
Class of Communication Service	U			
Maintain Dialogue			U	C(=)

**Table x-x. CM-server logon Service Parameter Table**

Time-sequence diagram for CM-server update with no dialogue existing:



The time-sequence diagram for the CM-server update with a dialogue existing:



Note that although this service may be used if a dialogue does not exist, the CM-ground-user must not be allowed to invoke this service without knowing for sure what CM version the aircraft is carrying, or else an abort will occur. This is the same case as with the regular CM-update service.

Parameter Name	Req	Ind
Aircraft Address	C	
Facility Designation	C	C(=)
Update Information	M	M(=)
Class of Communication Service	U	

**Table x-x. CM-server update Service Parameter Table**

#### **4. Conclusion**

This is an example of how the a CM server concept may be accommodated without “breaking” the ASN.1. There still are some points that will confirmation and/or further discussion:

- a. How many facilities need to be allowed for in the CM-server logon and CM-server update services?
- b. Does a CM server need the capability to ground forward CM-server logon information? If so, the ASN.1 will need to be changed.
- c. This method is setting a precedent in that future CM interactions must first perform a package 1 CM-logon attempt. Do other services need to have version negotiation capabilities as well?
- d. Do these services capture the intended functionalities of a CM server as currently envisioned?
- e. What are the impacts on aircrafts’ addressing databases?