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# VDV-Schrift

**301-2-0**

**08/2019**

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## IBIS-IP Beschreibung der Dienste / Service description

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DIENTST- / SERVICE-DeviceManagementService  
V2.2

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### **Gesamtbearbeitung**

Ausschuss für Telematik und Informationssysteme (ATI)

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# IBIS-IP Beschreibung der Dienste / Service description

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## DIENST- / SERVICE-DeviceManagementService V2.2

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## Vorwort

Im Forschungsprojekt „Internet Protokoll basierte Kommunikationsdienste im ÖV - IP-KOM-ÖV“, gefördert vom Bundesministerium für Wirtschaft und Energie BMWi, wurde das Grundkonzept von IBIS-IP für die Fahrgastinformation entwickelt.

In der VDV-301-2 werden die technischen Grundlagen wie auch die Basisdienste, welche die Grundlagen eines IBIS-IP-Systems bilden, beschrieben.

In dieser VDV-Schrift 301-2-0 werden der Gerätemanagement-Dienst und seine Operationen

- zur Abfrage statischer Informationen über das Gerät,
- zum Update der Software,
- zur Abfrage / Änderung der Geräte-Konfiguration,
- zum Reboot des Gerätes,
- zur Abfrage des Gerätestatus,
- zur Abfrage von Fehlermeldungen,

sowie die Operationen zu den Gerätediensten

- zur Abfrage statischer Informationen über die Gerätedienste,
- zum starten/stoppen/restarten von Diensten,
- zur Abfrage Zustand der Dienste abfragen

beschrieben.

Diese VDV-Schrift wird zweisprachig veröffentlicht. Dabei ist zu beachten, dass Erläuterungen in Deutsch und Englisch verfasst sind, während die technischen Operationen und zugehörigen Datenstrukturen, die sich an Softwareentwickler richten, nur in Englisch beschrieben sind.

## Foreword

In the research project "Internet Protocol based communication services in public transport - IP-KOM-ÖV", funded by the Federal Ministry of Economics and Energy BMWi, the basic concept of IBIS-IP for passenger information was developed.

The technical basics as well as the basic services of the IBIS-IP systems are described in the VDV-301-2.

In this VDV document 301-2-0 the device management service and its operations

- to query static information about the device,
- to update the software,
- to query / change the device configuration,
- to reboot the device,
- to query the device status,

- to query error messages,

as well as the operations to the device services

- to query static information about device services,
- to start/stop/restart services,
- query the status of the services

are described.

This VDV publication is published in two languages. It should be noted that explanations are written in German and English, while the technical operations and data structures related to software developers are described in English only.

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## Inhaltsverzeichnis / Content

<b>Vorwort.....</b>	<b>4</b>
<b>Foreword .....</b>	<b>4</b>
<b>Inhaltsverzeichnis / Content .....</b>	<b>6</b>
<b>Abkürzungen / Abbreviations .....</b>	<b>9</b>
<b>1 Dienst DeviceManagementService.....</b>	<b>10</b>
1.1 Aufgaben des Dienstes und die Nutzung	10
<b>1 DeviceManagementService .....</b>	<b>11</b>
1.1 Tasks of the Service and its Usage	11
<b>2 Operationen des DeviceManagementService .....</b>	<b>12</b>
2.1 Aktualisierung von Firmware und Konfiguration	12
2.1.1 Update-Prozess	13
<b>2 Operations of DeviceManagementService .....</b>	<b>14</b>
2.1 Update of Firmware and Configuration	16
2.1.1 Update Process	17
2.2 Data Structure of Operation GetDeviceInformation	17
2.2.1 Request	17
2.2.2 Response	17
2.3 Data Structure of Operation SubscribeDeviceInformation	18
2.4 Data Structure of Operation UnsubscribeDeviceInformation	18
2.5 Data Structure of Operation GetDeviceConfiguration	18
2.5.1 Request	18
2.5.2 Response	18
2.6 Data Structure of Operation GetDeviceStatus	18
2.6.1 Request	18
2.6.2 Response	19
2.7 Data Structure of Operation SubscribeDeviceStatus	19
2.8 Data Structure of Operation UnsubscribeDeviceStatus	19
2.9 Data Structure of Operation GetDeviceErrorMessages	19
2.9.1 Request	19
2.9.2 Response	19
2.10 Data Structure of Operation SubscribeDeviceErrorMessages	20
2.11 Data Structure of Operation UnsubscribeDeviceErrorMessages	20
2.12 Data Structure of Operation RestartDevice	20
2.12.1 Request	20
2.12.2 Response	20

2.13	<i>Data Structure of Operation GetServiceInformation</i>	20
2.13.1	Request	20
2.13.2	Response	20
2.14	<i>Data Structure of Operation SubscribeServiceInformation</i>	21
2.15	<i>Data Structure of Operation UnsubscribeServiceInformation</i>	21
2.16	<i>Data Structure of Operation GetServiceStatus</i>	21
2.16.1	Request	21
2.16.2	Response	21
2.17	<i>Data Structure of Operation SubscribeServiceStatus</i>	22
2.18	<i>Data Structure of Operation UnsubscribeServiceStatus</i>	22
2.19	<i>Data Structures of Operation GetAllSubdeviceInformation</i>	22
2.19.1	Request	22
2.19.2	Response	22
2.20	<i>Data Structures of Operation SubscribeAllSubdeviceInformation</i>	22
2.21	<i>Data Structures of Operation UnsubscribeAllSubdeviceInformation</i>	23
2.22	<i>Data Structures of Operation GetDeviceStatusInformation</i>	23
2.23	<i>Data Structures of Operation SubscribeDeviceStatusInformation</i>	24
2.24	<i>Data Structures of Operation UnsubscribeDeviceStatusInformation</i>	24
2.25	<i>Data Structures of Operation GetAllSubdeviceStatusInformation</i>	24
2.25.1	Request	24
2.25.2	Response	24
2.26	<i>Data Structures of Operation SubscribeAllSubdeviceStatusInformation</i>	25
2.27	<i>Data Structures of Operation UnsubscribeAllSubdeviceStatusInformation</i>	25
2.28	<i>Data Structures of Operation GetAllSubdeviceErrorMessages</i>	25
2.28.1	Request	25
2.28.2	Response	25
2.29	<i>Data Structures of Operation SubscribeAllSubdeviceErrorMessages</i>	26
2.30	<i>Data Structures of Operation UnsubscribeAllSubdeviceErrorMessages</i>	26
2.31	<i>Data Structures of Operation InstallUpdate</i>	26
2.31.1	Request	26
2.31.2	Response	26
2.32	<i>Data Structures of Operation RetrieveUpdateState</i>	28
2.32.1	Request	28
2.32.2	Response	28
1.33	<i>Data Structures of Operation GetUpdateHistory</i>	29
1.33.1	Request	29
1.33.2	Response	29
1.34	<i>Data Structures of Operation FinalizeUpdate</i>	30
1.34.1	Request	30
1.34.2	Response	30
1.35	<i>Data Structures of Operation FinalizeAllPendingUpdates</i>	30
1.35.1	Request	30
1.35.2	Response	30

<b>2</b>	<b>Versionshistorie / Version History .....</b>	<b>31</b>
2.1	Version 2.2	31
2.1.1	Funktionale Erweiterungen Functional Upgrade	31
2.1.2	Technische Ergänzungen/Korrekturen Technical Upgrade/Corrections	31
	<b>Tabellenverzeichnis.....</b>	<b>32</b>
	<b>Regelwerke – Normen und Empfehlungen / References .....</b>	<b>34</b>
	<b>Impressum .....</b>	<b>35</b>



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## Abkürzungen / Abbreviations

Die bereits in der VDV 301-1 definierten Abkürzungen werden an dieser Stelle nicht wiederholt.

The abbreviations already defined in VDV 301-1 are not repeated here.

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# 1 Dienst DeviceManagementService

## 1.1 Aufgaben des Dienstes und die Nutzung

Der Dienst *DeviceManagementService* ist der Dienst, welcher die Aufgaben der Fachkomponente Geräte-Management innerhalb von IBIS-IP umsetzt.

Der Dienst ist für alle Daten als http-Dienst spezifiziert.

Dieser Dienst ist auf jedem an IBIS-IP teilnehmenden Gerät einmal vorhanden und wird mit dem Ausführen der Applikation auf dem Gerät automatisch gestartet.

# 1 DeviceManagementService

## 1.1 Tasks of the Service and its Usage

The *DeviceManagementService* is a service which is used to maintain and manage the plugged devices.

A DeviceManagementService has to run on each device participating in the IBIS-IP network.

The *DeviceManagementService* is designed as an http-service.

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## 2 Operationen des DeviceManagementService

Die vom *DeviceManagementService* angebotenen Operationen lassen sich unterteilen in Operationen die das Gerät betreffen

- Statische Informationen über das Gerät abfragen
- Konfiguration des Geräts ändern
- Konfiguration des Geräts abfragen
- Gerät restarten
- Status des Geräts abfragen
- Fehlermeldungen abfragen

sowie Operationen, die die Dienste auf dem Gerät betreffen

- Statische Informationen über die Dienste
- Dienste starten/stoppen/restarten
- Zustand der Dienste abfragen

See Tabelle/Table 1

### 2.1 Aktualisierung von Firmware und Konfiguration

Eine Aktualisierung wird mit der Operationen `InstallUpdate` eingeleitet. Mit Hilfe dieser Operation kann ein Update-Controller einem IBIS-IP-Gerät eine Update-Datei übergeben, die dieses dann installiert. Der Speicherort der Update-Datei wird als URI übergeben. Das Gerät lädt die Datei herunter und prüft anschließend, ob diese sich für eine Aktualisierung eignet. Wenn das nicht der Fall ist, wird die Aktualisierung zurückgewiesen. Die Operation `RetrieveUpdateState` ist einzusetzen, um bei einer laufenden Aktualisierung deren aktuellen Status abzufragen. Nach dem Abschluss einer Aktualisierung ist diese mit der Operation `FinalizeUpdate` zu finalisieren.

Das IBIS-IP-Gerät speichert persistent eine Update-History. Diese kann mit Hilfe der Operation `GetUpdateHistory` abgefragt werden.

Abhängigkeiten von anderen Aktualisierungen können nicht verwaltet werden. Wenn unterschiedliche Komponenten eines IBIS-IP-Geräts zur selben Zeit passende Aktualisierungen erhalten müssen, sind diese in einer einzigen Update-Datei zusammenzufassen.

Der Update-Controller unterstützt keine Aktualisierungspläne.

Die richtige Zuordnung einer Update-Datei zu einem Gerät ist nicht die Aufgabe des Update-Controllers. Dafür ist der Update-Manager zuständig, der den Update-Controller bei Bedarf aufruft. Der Update-Controller gibt das Ergebnis einer Aktualisierung an den Update-Manager weiter. Dieser wertet es entsprechend aus.

Der Update-Controller muss eine Software sein und ist für diese Aufgaben zuständig:

- Steuerung des Update-Prozesses beginnend mit der Operation *InstallUpdate* und endend mit der Operation *FinalizeUpdate*
- Übergabe des Ergebnisses eines Updates an den Update-Manager

Der Update-Manager kann eine Software sein oder eine Person. Er ist für diese Aufgaben zuständig:

- Auswahl der Update-Datei
- Planung von Aktualisierungen

Der Update-Controller startet das Gerät neu, wenn es den Aktualisierungsstatus *DeviceRestartRequired* zurückmeldet. Mindestens nach dem Abschluss einer Aktualisierung ist das betreffende Gerät neu zu starten. Neustarts im Verlauf des Update-Prozesses müssen wie erforderlich ausgeführt werden. Der initiale Aktualisierungsstatus nach einem solchen Neustart muss *UpdateRunning* sein.

#### 2.1.1 Update-Prozess

1. Der Update-Controller führt die Operation *InstallUpdate* aus und setzt seine Tätigkeit fort, wenn das Gerät die Aktualisierung durch Rückgabe des Werts *UpdateAccepted* akzeptiert.
2. Mit Hilfe der Operation *RetrieveUpdateState* wird periodisch der Aktualisierungsstatus abgefragt. Das maximale Abfrageintervall beträgt 5s. Der minimale Wert ist 1s.
3. Das Gerät wird mittels der Operation *DeviceManagementService.RestartDevice* neu gestartet, wenn es den Aktualisierungsstatus *DeviceRestartRequired* zurückgibt.
4. Der Update-Controller wartet während das Gerät herunterfährt. Der Standardwert der Wartezeit ist 10s.
5. Der Update-Controller prüft, ob das Gerät wieder mit dem IBIS-IP-Netzwerk verbunden ist, und kehrt danach zur Abfrage des Aktualisierungsstatus zurück. Der Standardwert der Wartezeit auf das Wiederverbinden ist 5 Minuten.
6. Die Aktualisierung wird durch die Operation *FinalizeUpdate* finalisiert, wenn das Gerät einen anderen Aktualisierungsstatus als *UpdateRunning* oder *DeviceRestartRequired* zurückgibt. Die Aktualisierung ist zu wiederholen, wenn der finale Aktualisierungsstatus *DownloadUpdateFileFailed* ist.
7. Der Update-Controller übermittelt das Ergebnis der Aktualisierung an den Update-Manager.

Alle weiteren Informationen sind in Kapiteln 2.3 ff in englischer Sprache beschrieben.

## 2 Operations of DeviceManagementService

The *DeviceManagementService* Operations are defined in tasks dealing on the one side with the device functions like

- Request static information about the device
- Change the device configuration
- Request the device configuration
- Restart the device
- Request the current device status
- Request error codes from the device

and on the other side with functions for Services on the device like

- Static information about the services
- Request the state of the services

Operation	Request	Verwendeter Datentyp, Datenstruktur
GetDeviceInformation	Req.	-
	Resp.	DeviceManagementService. GetDeviceInformationResponseStructure
SubscribeDeviceInformation	Req.	SubscribeRequestStructure
	Resp.	SubscribeResponseStructure
UnsubscribeDeviceInformation	Req.	UnsubscribeRequestStructure
	Resp.	UnsubscribeResponseStructure
GetDeviceConfiguration	Req.	-
	Resp.	DeviceManagementService. GetDeviceConfigurationResponseStructure
GetDeviceStatus	Req.	-
	Resp.	DeviceManagementService. GetDeviceStatusResponseStructure
SubscribeDeviceStatus	Req.	SubscribeRequestStructure
	Resp.	SubscribeResponseStructure
UnsubscribeDeviceStatus	Req.	UnsubscribeRequestStructure
	Resp.	UnsubscribeResponseStructure
GetDeviceErrorMessages	Req.	-
	Resp.	DeviceManagementService. GetDeviceErrorMessagesResponseStructure
SubscribeDeviceErrorMessages	Req.	SubscribeRequestStructure
	Resp.	SubscribeResponseStructure
UnsubscribeDeviceErrorMessages	Req.	UnsubscribeRequestStructure
	Resp.	UnsubscribeResponseStructure
RestartDevice <sup>1</sup>	Req.	-
	Resp.	DataAcceptedResponseStructure
GetServiceInformation	Req.	-

Operation	Request	Verwendeter Datentyp, Datenstruktur
	Resp.	DeviceManagementService. GetServiceInformationResponseStructure
SubscribeServiceInformation	Req.	SubscribeRequestStructure
	Resp.	SubscribeResponseStructure
UnsubscribeServiceInformation	Req.	UnsubscribeRequestStructure
	Resp.	UnsubscribeResponseStructure
GetServiceStatus	Req.	-
	Resp.	DeviceManagementService. GetServiceStatusResponseStructure
SubscribeServiceStatus	Req.	SubscribeRequestStructure
	Resp.	SubscribeResponseStructure
UnsubscribeServiceStatus	Req.	UnsubscribeRequestStructure
	Resp.	UnsubscribeResponseStructure
GetAllSubdeviceInformation	Req.	-
	Resp.	DeviceManagementService. GetAllSubdeviceInformationResponseStructure
SubscribeAllSubdeviceInformation	Req.	SubscribeRequestStructure
	Resp.	SubscribeResponseStructure
UnsubscribeAllSubdeviceInformation	Req.	UnsubscribeRequestStructure
	Resp.	UnsubscribeResponseStructure
GetDeviceStatusInformation	Req.	-
	Resp.	DeviceManagementService. GetDeviceStatusInformationResponseStructure
SubscribeDeviceStatusInformation	Req.	SubscribeRequestStructure
	Resp.	SubscribeResponseStructure
UnsubscribeDeviceStatusInformation	Req.	UnsubscribeRequestStructure
	Resp.	UnsubscribeResponseStructure
GetAllSubdeviceStatusInformation	Req.	-
	Resp.	DeviceManagementService. GetAllSubdeviceStatusInformationResponseStructure
Subscribe AllSubdeviceStatusInformation	Req.	SubscribeRequestStructure
	Resp.	SubscribeResponseStructure
Unsubscribe AllSubdeviceStatusInformation	Req.	UnsubscribeRequestStructure
	Resp.	UnsubscribeResponseStructure
GetAllSubdeviceErrorMessages	Req.	-
	Resp.	DeviceManagementService. GetAllSubdeviceErrorMessagesResponseStructure
SubscribeAllSubdeviceErrorMessages	Req.	SubscribeRequestStructure
	Resp.	SubscribeResponseStructure
Unsubscribe AllSubdeviceErrorMessages	Req.	UnsubscribeRequestStructure
	Resp.	UnsubscribeResponseStructure
InstallUpdate <sup>1</sup>	Req.	DeviceManagementService. InstallUpdateRequestStructure
	Resp.	DeviceManagementService. InstallUpdateResponseStructure
RetrieveUpdateState <sup>1</sup>	Req.	DeviceManagementService. RetrieveUpdateStateRequestStructure
	Resp.	DeviceManagementService. RetrieveUpdateStateResponseStructure
GetUpdateHistory <sup>1</sup>	Req.	-

Operation	Request	Verwendeter Datentyp, Datenstruktur
	Resp.	DeviceManagementService. GetUpdateHistoryResponseStructure
FinalizeUpdate <sup>1</sup>	Req.	DeviceManagementService. FinalizeUpdateRequestStructure
	Resp.	DeviceManagementService. FinalizeUpdateResponseStructure
FinalizeAllPendingUpdates <sup>1</sup>	Req.	-
	Resp.	DataAcceptedResponseStructure

Tabelle/Table 1 Beschreibung von Operationen des DeviceManagementService /  
Description of Operationen des DeviceManagementService

<sup>1)</sup> Operation is optional

## 2.1 Update of Firmware and Configuration

Update is initiated by operation InstallUpdate. Using this operation an update controller provides an update file for an IBIS-IP device which can be used by the device for installation. Location of the update file is given by an URI. Device downloads update file and checks it afterwards. Update is rejected if update file is not suitable. Operation RetrieveUpdateState has to be used during running update to get its current state. After completion of update it has to be finalized using operation FinalizeUpdate.

Update history is persistently stored by IBIS-IP device. It can be queried using operation GetUpdateHistory.

Management of dependencies to other updates is not covered. If several components of an IBIS-IP device must receive different updates at the same time, these updates must be included in a single update file.

Update controller does not support update schedules.

Right assignment of update file to the device to be updated is not the task of the update controller but of an update manager which calls the update controller as needed. Update controller reports the update result to the update manager which handles the result appropriately.

The update controller has to be a program. These tasks are assigned to it:

- Controlling of update process beginning with operation InstallUpdate and ending with operation FinalizeUpdate
- Reporting update result to update manager

The update manager may be a program or a person. These tasks are assigned to it:

- Selection of update file
- Scheduling of updates

The update controller restarts device if it returns update status *DeviceRestartRequired*. At least at the end of an update a restart of the updated device is required. Intermediate restarts shall be done as needed. Initial update status after an intermediate restart shall be *UpdateRunning*.



### 2.1.1 Update Process

1. Update controller performs operation *InstallUpdate* and continues if the device accepts the update by returning *UpdateAccepted*.
2. Query update state periodically using operation *RetrieveUpdateState*. Maximum query interval is 5s. Minimum query interval is 1s.
3. Restart device using operation *DeviceManagementService.RestartDevice* if the device returns update status *DeviceRestartRequired*.
4. Wait while the device shuts down. The default value of the shut down wait time is 10s.
5. Check if the device is reconnected to the IBIS-IP network and go to update state query afterwards. The default value of the reconnect wait time is 5 minutes.
6. Finalize the update using operation *FinalizeUpdate* if the device returns any other update status than *UpdateRunning* or *DeviceRestartRequired*. Repeat the update if the final update status is *DownloadUpdateFileFailed*.
7. Report the update result to the update manager.

## 2.2 Data Structure of Operation GetDeviceInformation

The operation *GetDeviceInformation* returns static device information like serial number, manufacturer etc.

### 2.2.1 Request

Because of being a ***GetDeviceInformation*** operation, there is no request structure for this operation.

### 2.2.2 Response

<i>DeviceManagementService.GetDeviceInformationResponse</i>			+Structure	Request structure with non configuration able device information
			choice	One of the choices below
a	<i>DeviceManagementService.GetDeviceInformationResponseData</i>	-1:1	+ <i>DeviceManagementService.GetDeviceInformationResponseData</i>	Detailed request structure with the non configurable device parameters (cf. table below)
b	<i>OperationErrorMessage</i>		IBIS-IP.string	Error message

Table 2 Description of *DeviceManagementService.GetDeviceInformationResponse*

<i>DeviceManagementService.GetDeviceInformationResponseData</i>			+Structure	Detailed response structure with static device settings
	<i>TimeStamp</i>	1:1	IBIS-IP.dateTime	Response time stamp
	<i>DeviceInformation</i>	1:1	+ <i>DeviceInformation</i>	Detailed response structure (cf. VDV 301-2-1)

Table 3 Description of *DeviceManagementService.GetDeviceInformationResponseData*

The data structures described in VDV 301-2-1 are used to set up subscriptions.

## 2.3 Data Structure of Operation SubscribeDeviceInformation

The data structures described in VDV 301-2-1 are used to set up subscriptions.

## 2.4 Data Structure of Operation UnsubscribeDeviceInformation

For the subscription the data structures from VDV 301-2-1 are used.

## 2.5 Data Structure of Operation GetDeviceConfiguration

The **GetDeviceConfiguration** operation enables to set the single variable parameter of a device. This parameter is the device –ID, which is used as a reference to the plugged position inside the vehicle

### 2.5.1 Request

Because of being a **GetDeviceConfiguration** operation, there is no request structure for this operation.

### 2.5.2 Response

<i>DeviceManagementService.GetDeviceConfigurationResponse</i>			<i>+Structure</i>	Response structure with device configuration data content
			<i>choice</i>	One of the structures below
<i>a</i>	<i>DeviceManagementService.GetDeviceConfigurationResponseData</i>	<i>–1:1</i>	<i>+DeviceManagementService.GetDeviceConfigurationResponseData</i>	Detailed response structure with the device configuration (cf. below)
<i>b</i>	<i>OperationErrorMessage</i>		<i>IBIS-IP.string</i>	Error message

Table 4 Description of DeviceManagementService.GetDeviceConfigurationResponse

<i>DeviceManagementService.GetDeviceConfigurationResponseData</i>			<i>+Structure</i>	Detailed response structure with the device configuration
	<i>TimeStamp</i>	<i>1:1</i>	<i>IBIS-IP.dateTime</i>	Response time stamp
	<i>DeviceID</i>	<i>1:1</i>	<i>IBIS-IP.int</i>	Device-ID (device plug-in position)

Table 5 Description of DeviceManagementService.GetDeviceConfigurationResponseData

## 2.6 Data Structure of Operation GetDeviceStatus

### 2.6.1 Request

Because of being a **GetDeviceStatus** operation, there is no request structure for this operation.

## 2.6.2 Response

<i>DeviceManagementService.GetDeviceStatusResponse</i>			<i>+Structure</i>	Response structure with the device status
			<i>choice</i>	One of the structures below
<i>a</i>	<i>DeviceManagementService.GetDeviceStatusResponseData</i>	<b>–1:1</b>	<i>+DeviceManagementService.GetDeviceStatusResponseData</i>	Detailed response structure with the device status information (cf. below)
<i>b</i>	<i>OperationErrorMessage</i>		<i>IBIS-IP.string</i>	Error message

Table 6 Description of DeviceManagementService.GetDeviceStatusResponse

<i>DeviceManagementService.GetDeviceStatusResponseData</i>			<i>+Structure</i>	Detailed response structure with the device status information
	<i>TimeStamp</i>	<b>1:1</b>	<i>IBIS-IP.dateTime</i>	Response time stamp
	<i>DeviceState</i>	<b>1:1</b>	<i>DeviceStateEnumeration</i>	Device status (cf. VDV 301-2-1)

Table 7 Description of DeviceManagementService.GetDeviceStatusResponseData

## 2.7 Data Structure of Operation SubscribeDeviceStatus

The data structures described in VDV 301-2-1 are used to set up subscriptions.

## 2.8 Data Structure of Operation UnsubscribeDeviceStatus

The data structures described in VDV 301-2-1 are used to set up subscriptions.

## 2.9 Data Structure of Operation GetDeviceErrorMessages

### 2.9.1 Request

Because of being a *GetDeviceErrorMessage* operation, there is no request structure for this operation.

### 2.9.2 Response

<i>DeviceManagementService.GetDeviceErrorMessagesResponse</i>			<i>+Structure</i>	Response structure for device error messages
			<i>choice</i>	One of the choices below
<i>a</i>	<i>DeviceManagementService.GetDeviceErrorMessagesResponseData</i>	<b>–1:1</b>	<i>+DeviceManagementService.GetDeviceErrorMessagesResponseData</i>	Detailed response structure for device errors
<i>b</i>	<i>OperationErrorMessage</i>		<i>IBIS-IP.string</i>	Error message

Table 8 Description of DeviceManagementService.GetDeviceErrorMessagesResponse

<i>DeviceManagementService.GetDeviceErrorMessagesResponseData</i>			<i>+Structure</i>	Detailed response structure for device errors
	<i>TimeStamp</i>	1:1	<i>IBIS-IP.dateTime</i>	Response time stamp
	<i>ErrorMessage</i>	10:*	<i>+ Message</i>	Error message

Table 9 Description of DeviceManagementService.GetDeviceErrorMessagesResponseData

## 2.10 Data Structure of Operation SubscribeDeviceErrorMessages

The data structures described in VDV 301-2-1 are used to set up subscriptions.

## 2.11 Data Structure of Operation UnsubscribeDeviceErrorMessages

The data structures described in VDV 301-2-1 are used to set up subscriptions.

## 2.12 Data Structure of Operation RestartDevice

### 2.12.1 Request

With the request **RestartDevice** is no data transmitted.

### 2.12.2 Response

For the acknowledge of the request the DataAcceptedResponseStructure (cf. VDV 301-2-1) is used.

## 2.13 Data Structure of Operation GetServiceInformation

### 2.13.1 Request

Because of being a **GetServiceInformation** operation, there is no request structure for this operation.

### 2.13.2 Response

<i>DeviceManagementService.GetServiceInformationResponse</i>			<i>+Structure</i>	Response structure with information about the available services at the device
			<i>choice</i>	One of the choices below
	<i>a</i>	<i>DeviceManagementService.GetServiceInformationResponseData</i>	<i>-1:1</i>	Detailed response structure with information about the available services (cf. below)
	<i>b</i>	<i>OperationErrorMessage</i>		Error message

Table 10 Description of DeviceManagementService.GetServiceInformationResponse

<i>DeviceManagementService.GetServiceInformationResponseData</i>			<i>+Structure</i>	Detailed response structure with information about the available services
	<b>TimeStamp</b>	<b>1:1</b>	<i>IBIS-IP.dateTime</i>	Response time stamp
	<b>ServiceInformationList</b>	<b>1:1</b>	<i>+ServiceInformationList</i>	List of available services (cf. VDV 301-2-1)

Table 11 Description of DeviceManagementService.GetServiceInformationResponseData

## 2.14 Data Structure of Operation SubscribeServiceInformation

For this subscription the data structures from VDV 301-2-1 are used.

## 2.15 Data Structure of Operation UnsubscribeServiceInformation

To terminate this subscription the structures of VDV 301-2-1 are used.

## 2.16 Data Structure of Operation GetServiceStatus

### 2.16.1 Request

Because of being a *GetServiceStatus* operation, there is no request structure for this operation.

### 2.16.2 Response

<i>DeviceManagementService.GetServiceStatusResponse</i>			<i>+Structure</i>	Response structure with status information about the services located at the device
			<i>choice</i>	One of the choices below
<i>a</i>	<b>DeviceManagementService.GetServiceStatusResponseData</b>	<b>-1:1</b>	<i>+DeviceManagementService.GetServiceStatusResponseData</i>	Detailed response structure with the status of services running on the device (cf. below)
<i>b</i>	<b>OperationErrorMessage</b>		<i>IBIS-IP.string</i>	Error message

Table 12 Description of DeviceManagementService.GetServiceStatusResponse

<i>DeviceManagementService.GetServiceStatusResponseData</i>			<i>+Structure</i>	Detailed response structure with the services located at the device
	<b>TimeStamp</b>	<b>1:1</b>	<i>IBIS-IP.dateTime</i>	Response time stamp
	<b>ServiceSpecificationWithStateList</b>	<b>1:1</b>	<i>+ServiceSpecificationWithStateList</i>	Service list including the status (cf. VDV 301-2-1)

Table 13 Description of DeviceManagementService.GetServiceStatusResponseData

## 2.17 Data Structure of Operation SubscribeServiceStatus

For this subscription the data structures from chapters VDV 301-2-1 are used.

## 2.18 Data Structure of Operation UnsubscribeServiceStatus

To terminate this subscription the structures of chapters VDV 301-2-1 are used.

## 2.19 Data Structures of Operation GetAllSubdeviceInformation

### 2.19.1 Request

Because of being a **Get** operation, there is no request structure for operation **GetAllSubdeviceInformation**.

### 2.19.2 Response

<b>DeviceManagementService. GetAllSubdeviceInformationResponse</b>			<b>+Structure</b>	<b>Response structure of operation GetAllSubdeviceInformation</b>
			<i>choice</i>	One of the structures below
	<i>a</i>	<b>DeviceManagementService.GetAllSubdeviceInformationResponseData</b>	<b>-1:1</b>	Detailed response structure for static parameters of subdevices (cf. table below)
	<i>b</i>	<b>OperationErrorMessage</b>	<i>IBIS-IP.string</i>	Error message indicating cause of failure of operation

Table 14 Description of DeviceManagementService.GetAllSubdeviceInformationResponse

<b>DeviceManagementService. GetAllSubdeviceInformationResponseData</b>			<b>+Structure</b>	<b>Detailed response structure for static parameters of subdevices</b>
	<b>TimeStamp</b>	<b>1:1</b>	<i>IBIS-IP.dateTime</i>	Response time stamp
	<b>SubdeviceInformationList</b>	<b>1:*</b>	<i>+SubdeviceInformation</i>	List of static parameters of subdevices (cf. table below)

Table 15 Description of DeviceManagementService.GetAllSubdeviceInformationResponseData

<b>DeviceManagementService. SubdeviceInformation</b>			<b>+Structure</b>	<b>Static parameters of subdevices</b>
	<b>SubdeviceName</b>	<b>1:1</b>	<i>IBIS-IP.string</i>	Name of subdevice
	<b>DeviceInformation</b>	<b>1:1</b>	<i>+DeviceInformation</i>	Static device parameters (cf. VDV 301-2-1)

Table 16 Description of DeviceManagementService.SubdeviceInformationStructure

## 2.20 Data Structures of Operation SubscribeAllSubdeviceInformation

Data structures described in document VDV 301-2-1 are used to establish subscription.

## 2.21 Data Structures of Operation UnsubscribeAllSubdeviceInformation

Data structures described in document VDV 301-2-1 are used to terminate subscription.

## 2.22 Data Structures of Operation GetDeviceStatusInformation

### 2.22.1.1 Request

Because of being a **Get** operation, there is no request structure for operation **GetDeviceStatusInformation**.

### 2.22.1.2 Response

<b>DeviceManagementService. GetDeviceStatusInformationResponse</b>			<b>+Structure</b>	<b>Response structure of operation GetDeviceStatusInformation</b>
			<i>choice</i>	One of the structures below
<i>a</i>	<b>DeviceManagementService.DeviceStatusInformationResponseData</b>	<b>-1:1</b>	<i>+DeviceManagementService.GetDeviceStatusInformationResponseData</i>	Detailed response structure for detailed device status (cf. table below)
<i>b</i>	<b>OperationErrorMessage</b>		<i>IBIS-IP.string</i>	Error message indicating cause of failure of operation

Table 17 Description of DeviceManagementService.GetDeviceStatusInformationResponse

<b>DeviceManagementService. GetDeviceStatusInformationResponseData</b>			<b>+Structure</b>	<b>Detailed response structure for detailed device status</b>
	<b>TimeStamp</b>	<b>1:1</b>	<i>IBIS-IP.dateTime</i>	Response time stamp
	<b>DeviceStatusInformation</b>	<b>1:1</b>	<i>+DeviceStatusInformation</i>	Detailed device status (cf. table below)

Table 18 Description of DeviceManagementService.GetDeviceStatusInformationResponseData

<b>DeviceManagementService. DeviceStatusInformation</b>			<b>+Structure</b>	<b>Detailed device status</b>
	<b>DeviceState</b>	<b>1:1</b>	<i>DeviceStateEnumeration</i>	Common device state (cf. VDV 301-2-1)
	<b>DeviceStatusList</b>	<b>0:*</b>	<i>+DeviceStatus</i>	List of statuses (cf. table below)

Table 19 Description of DeviceManagementService.DeviceStatusInformationStructure

<b>DeviceManagementService.DeviceStatus</b>			<b>+Structure</b>	<b>Status</b>
	<b>DeviceStatusName</b>	<b>1:1</b>	<i>IBIS-IP.string</i>	Name of status
	<b>DeviceStatusFlag</b>	<b>1:1</b>	<i>IBIS-IP.boolean</i>	Activation of status

Table 20 Description of DeviceManagementService.DeviceStatusStructure

## 2.23 Data Structures of Operation SubscribeDeviceStatusInformation

Data structures described in document VDV 301-2-1 are used to establish subscription.

## 2.24 Data Structures of Operation UnsubscribeDeviceStatusInformation

Data structures described in document VDV 301-2-1 are used to terminate subscription.

## 2.25 Data Structures of Operation GetAllSubdeviceStatusInformation

### 2.25.1 Request

Because of being a **Get** operation, there is no request structure for operation **GetAllSubdeviceStatusInformation**.

### 2.25.2 Response

<b>DeviceManagementService. GetAllSubdeviceStatusInformation Response</b>			<b>+Structure</b>	<b>Response structure of operation GetAllSubdeviceStatusInformation</b>
			<i>choice</i>	One of the structures below
	<i>a</i>	<b>DeviceManagementService.GetAllSubdeviceStatusInformationResponseData</b>	<b>-1:1</b>	Detailed response structure for detailed statuses of subdevices (cf. table below)
	<i>b</i>	<b>OperationErrorMessage</b>	<i>IBIS-IP.string</i>	Error message indicating cause of failure of operation

Table 21 Description of DeviceManagementService.GetAllSubdeviceStatusInformationResponse

<b>DeviceManagementService. GetAllSubdeviceStatusInformation ResponseData</b>			<b>+Structure</b>	<b>Detailed response structure for detailed statuses of subdevices</b>
	<b>TimeStamp</b>	<b>1:1</b>	<i>IBIS-IP.dateTime</i>	Response time stamp
	<b>SubdeviceStatusInformationList</b>	<b>1:*</b>	<b>+SubdeviceStatusInformation</b>	List of detailed statuses of subdevices (cf. table below)

Table 22 Description of DeviceManagementService.GetAllSubdeviceStatusInformationResponseData

<b>DeviceManagementService. SubdeviceStatusInformation</b>			<b>+Structure</b>	<b>Detailed status of subdevice</b>
	<b>SubdeviceName</b>	<b>1:1</b>	<i>IBIS-IP.string</i>	Name of subdevice
	<b>DeviceStatusInformation</b>	<b>1:1</b>	<b>+DeviceStatusInformation</b>	Detailed device status (cf. table 27)

Table 23 Description of DeviceManagementService.SubdeviceStatusInformationStructure



## 2.26 Data Structures of Operation SubscribeAllSubdeviceStatusInformation

Data structures described in document VDV 301-2-1 are used to establish subscription.

## 2.27 Data Structures of Operation UnsubscribeAllSubdeviceStatusInformation

Data structures described in document VDV 301-2-1 are used to terminate subscription.

## 2.28 Data Structures of Operation GetAllSubdeviceErrorMessages

### 2.28.1 Request

Because of being a **Get** operation, there is no request structure for operation **GetAllSubdeviceErrorMessages**.

### 2.28.2 Response

<i>DeviceManagementService. GetAllSubdeviceErrorMessagesResponse</i>			+Structure	Response structure of operation GetAllSubdeviceErrorMessages
			choice	One of the structures below
a	<b>DeviceManagementService.GetAllSubdeviceErrorMessagesResponseData</b>	-1:1	+DeviceManagementService.GetAllSubdeviceErrorMessagesResponseData	Detailed response structure for error messages of subdevices (cf. table below)
b	<b>OperationErrorMessage</b>		IBIS-IP.string	Error message indicating cause of failure of operation

Table 24 Description of DeviceManagementService.GetAllSubdeviceErrorMessagesResponse

<i>DeviceManagementService. GetAllSubdeviceErrorMessagesResponseData</i>			+Structure	Detailed response structure for error messages of subdevices
	<b>TimeStamp</b>	1:1	IBIS-IP.dateTime	Response time stamp
	<b>SubdeviceErrorMessagesList</b>	1:*	+SubdeviceErrorMessages	List of error messages of subdevices (cf. table below)

Tabelle 25 Description of DeviceManagementService.GetAllSubdeviceErrorMessagesResponseData

<i>DeviceManagementService. SubdeviceErrorMessages</i>			+Structure	Error messages of subdevice
	<b>SubdeviceName</b>	1:1	IBIS-IP.string	Name of subdevice
	<b>ErrorMessage</b>	10:*	+Message	Error messages and warnings only (no status information, cf. VDV 301-2-1)

Table 26 Description of DeviceManagementService.SubdeviceErrorMessagesStructure

## 2.29 Data Structures of Operation SubscribeAllSubdeviceErrorMessages

Data structures described in document VDV 301-2-1 are used to establish subscription.

## 2.30 Data Structures of Operation UnsubscribeAllSubdeviceErrorMessages

Data structures described in document VDV 301-2-1 are used to terminate subscription.

## 2.31 Data Structures of Operation InstallUpdate

This operation asks a peripheral device to install a new update. In case there are other necessary dependencies or update conditions these must be included in the update package itself. There must be only one active update per device at any time. If a device receives a new *InstallUpdate* request while a previous update job is not finished yet the new request must not be accepted.

### 2.31.1 Request

<i>DeviceManagementService. InstallUpdateRequest</i>			<i>+Structure</i>	Request structure of DeviceManagementService
	<b>UpdateID</b>	<b>1:1</b>	<i>IBIS-IP. NMTOKEN</i>	Unique id generated by the controller to identify an update job
	<b>UpdateTimestamp</b>	<b>1:1</b>	<i>IBIS-IP. dateTime</i>	Timestamp used for GetUpdateStates and RetrieveUpdateState responses and for logging
	<b>UpdateURL</b>	<b>1:1</b>	<i>IBIS-IP.anyURI</i>	URL from which the device shall download the update file
	<b>UpdateFileChecksum</b>	<b>0:1</b>	<i>Checksum Structure</i>	Optional checksum of update file
	<b>UpdateFileSize</b>	<b>0:1</b>	<i>IBIS-IP. unsignedLong</i>	Optional size of update file

Table 27 Description of DeviceManagementService.InstallUpdateRequestStructure

The UpdateURL shall be valid until the update process is finished. End of update is signalled by operation FinalizeUpdate.

Minimum requirement for any device is to enable transfer of update file using HTTP.

### 2.31.2 Response

<i>DeviceManagementService. InstallUpdateResponse</i>			<i>+Structure</i>	Response structure of DeviceManagementService	
			<i>choice</i>	One of the structures below	
	<i>a</i>	<b><i>UpdateAccept</i></b>	<b>−1:1</b>	<i>UpdateAcceptE numeration</i>	Enumeration (cf. Table 29 below)
	<i>b</i>	<b><i>OperationErrorMessage</i></b>		<i>IBIS-IP.string</i>	Error message indicating cause of failure of operation

Table 28 Description of DeviceManagementService.InstallUpdateResponseStructure

Enumeration	Defined Values	Description
<i>UpdateAcceptEnumeration</i>	UpdateAccepted URLTypeUnknown  NoUpdatesAllowed ToBePostponed	Update will be performed URL type has been rejected, e.g. FTP may not supported by some devices No updates are possible Update has to be postponed

Table 29      Description of UpdateAcceptEnumeration

On accepting an update the device may change to a special update mode. Some desired device functionality may not be available during the update. After accepting an update the device shall handle the corresponding *UpdateID* as a known request parameter. The initial update status shall be *UpdateRunning*.

## 2.32 Data Structures of Operation RetrieveUpdateState

This operation is used to retrieve the update state of active update job. The job is specified by an *UpdateID*.

### 2.32.1 Request

<i>DeviceManagementService. RetrieveUpdateStateRequest</i>			<i>+Structure</i>	Request structure of DeviceManagementService
	<b>UpdateID</b>	<b>1:1</b>	<i>IBIS-IP. NMTOKEN</i>	Unique id generated by the controller to identify an update job

Table 30 Description of DeviceManagementService.RetrieveUpdateStateRequestStructure

### 2.32.2 Response

If the requested UpdateID is unknown, an operation error message is returned.

<i>DeviceManagementService. RetrieveUpdateStateResponse</i>			<i>+Structure</i>	Response structure of DeviceManagementService
			<i>Choice</i>	One of the structures below
<i>a</i>	<b>UpdateStateData</b>	<b>-1:1</b>	<i>+DeviceManagementService. UpdateStateData</i>	Detailed response structure (cf. Table 32 below)
<i>b</i>	<b>OperationErrorMessage</b>		<i>IBIS-IP.string</i>	Error message indicating cause of failure of operation

Table 31 Description of DeviceManagementService.RetrieveUpdateStateResponseStructure

<i>DeviceManagementService. UpdateStateData</i>			<i>+Structure</i>	Response structure of DeviceManagementService
	<b>UpdateID</b>	<b>1:1</b>	<i>IBIS-IP. NMTOKEN</i>	Unique id generated by the controller to identify an update job
	<b>UpdateTimestamp</b>	<b>1:1</b>	<i>IBIS-IP. dateTime</i>	Timestamp given by operation InstallUpdate
	<b>UpdateStatus</b>	<b>1:1</b>	<i>UpdateStatusE numeration</i>	Current status of update (cf. Table 33 below)
	<b>UpdateDetails</b>	<b>0:1</b>	<i>IBIS-IP.string</i>	Optional device specific update log

Table 32 Description of DeviceManagementService.UpdateStateDataStructure

Enumeration	Defined Values	Description
<i>UpdateStatusEnumeration</i>	UpdateRunning DeviceRestartRequired  DownloadUpdateFileFailed  UpdateFileCorrupted UpdateNotNecessary  InstallationFailed  InstallationSuccessful	Update in progress Device has to be restarted by operation RestartDevice Specified update file could not be downloaded from URL Specified update file is not usable State of device firmware already as required Update failed e.g. due to memory write error Update successfully completed

Table 33 Description of UpdateStatusEnumeration

## 2.33 Data Structures of Operation GetUpdateHistory

This operation is used to get the update history of a device. It needs no request data.

### 2.33.1 Request

Because of being a **Get** operation, there is no request structure for operation **GetUpdateHistory**.

### 2.33.2 Response

<i>DeviceManagementService. GetUpdateHistoryResponse</i>			<i>+Structure</i>	Response structure of DeviceManagementService
			<i>Choice</i>	One of the structures below
<i>a</i>	<b>UpdateHistory</b>	<b>-1:1</b>	<i>+DeviceManagementService. UpdateHistory</i>	Detailed response structure (cf. table below)
<i>b</i>	<b>OperationErrorMessage</b>		<i>IBIS-IP.string</i>	Error message indicating cause of failure of operation

Table 34 Description of DeviceManagementService.GetUpdateHistoryResponseStructure

<i>DeviceManagementService. UpdateHistory</i>			<i>+Structure</i>	Response structure of DeviceManagementService
	<b>UpdateHistoryEntry</b>	<b>0:*</b>	<i>+DeviceManagementService. UpdateHistoryEntry</i>	List of updates (empty if the device was not updated yet) Cf. table below

Table 35 Description of DeviceManagementService.UpdateHistoryStructure

Minimum requirement for any device allowing updates is an update history depth of 1, i.e. history shall contain at least the last update performed (regardless of its result), if there was any.

<i>DeviceManagementService. UpdateHistoryEntry</i>			<i>+Structure</i>	Response structure of DeviceManagementService
	<b>UpdateID</b>	<b>1:1</b>	<i>IBIS-IP. NMTOKEN</i>	Unique id generated by the controller to identify an update job
	<b>UpdateTimestamp</b>	<b>1:1</b>	<i>IBIS-IP. dateTime</i>	Timestamp given by operation InstallUpdate
	<b>UpdateURL</b>	<b>1:1</b>	<i>IBIS-IP.anyURI</i>	URL from which the device downloaded the update file
	<b>UpdateStatus</b>	<b>1:1</b>	<i>UpdateStatusE numeration</i>	Status of update (cf. Table 33 above) Typically final status (InstallationSuccessfull or InstallationFailed)
	<b>DataVersionList</b>	<b>0:1</b>	<i>+DataVersionLi st</i>	Optional list of updated components
	<b>UpdateDetails</b>	<b>0:1</b>	<i>IBIS-IP.string</i>	Optional device specific update log

Table 36 Description of DeviceManagementService.UpdateHistoryEntryStructure

## 2.34 Data Structures of Operation FinalizeUpdate

Any accepted update job has to be finished by performing the operation *FinalizeUpdate*. The job is specified by an *UpdateID*.

### 2.34.1 Request

<i>DeviceManagementService. FinalizeUpdateRequest</i>		<i>+Structure</i>		Request structure of DeviceManagementService
	<i>UpdateID</i>	1:1	<i>IBIS-IP. NMTOKEN</i>	Unique id generated by the controller to identify an update job

Table 37 Description of DeviceManagementService.FinalizeUpdateRequestStructure

### 2.34.2 Response

If the requested *UpdateID* is unknown an operation error message is returned.

<i>DeviceManagementService. FinalizeUpdateResponse</i>		<i>+Structure</i>		Response structure of DeviceManagementService
			<i>Choice</i>	One of the structures below
<i>a</i>	<i>UpdateStatus</i>	-1:1	<i>UpdateStatus Enumeration</i>	Status of update on its finalization
<i>b</i>	<i>OperationErrorMessage</i>		<i>IBIS-IP.string</i>	Error message indicating cause of failure of operation

Table 38 Description of DeviceManagementService.FinalizeUpdateResponseStructure

If the device receives a valid *FinalizeUpdateRequest* it returns to normal operation and the requested *UpdateID* is no longer valid.

Operation *FinalizeUpdate* has to be done in these cases:

1. Device returns any other update status than *UpdateRunning* or *DeviceRestartRequired*.
2. Update has to be cancelled because the update controller is shut down.

## 2.35 Data Structures of Operation FinalizeAllPendingUpdates

All pending update jobs stored in update history are finalized.

### 2.35.1 Request

There are no data used by the request.

### 2.35.2 Response

Common DataAcceptedResponseStructure is used.

Operation *FinalizeAllPendingUpdates* has to be done if operation *InstallUpdate* returns *NoUpdatesAllowed*.

---

## 2 Versionshistorie / Version History

### 2.1 Version 2.2

#### 2.1.1 Funktionale Erweiterungen Functional Upgrade

- Operationen zur Aktivierung/Deaktivierung von Geräten und Diensten entfernt  
Operation for activation/deactivation of devices and services deleted
- Optionale Methode in Tabelle 1 markiert  
marked methodes in table 1 as optional

#### 2.1.2 Technische Ergänzungen/Korrekturen Technical Upgrade/Corrections

- Keine/none

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## Tabellenverzeichnis

Tabelle/Table 1	Beschreibung von Operationen des DeviceManagementService / Description of Operationen des DeviceManagementService	16
Table 2	Description of DeviceManagementService.GetDeviceInformationResponse	17
Table 3	Description of DeviceManagementService.GetDeviceInformationResponseData	17
Table 4	Description of DeviceManagementService.GetDeviceConfigurationResponse	18
Table 5	Description of DeviceManagementService.GetDeviceConfigurationResponseData	18
Table 6	Description of DeviceManagementService.GetDeviceStatusResponse	19
Table 7	Description of DeviceManagementService.GetDeviceStatusResponseData	19
Table 8	Description of DeviceManagementService.GetDeviceErrorMessagesResponse	20
Table 9	Description of DeviceManagementService.GetDeviceErrorMessagesResponseData	20
Table 10	Description of DeviceManagementService.GetServiceInformationResponse	21
Table 11	Description of DeviceManagementService.GetServiceInformationResponseData	21
Table 12	Description of DeviceManagementService.GetServiceStatusResponse	21
Table 13	Description of DeviceManagementService.GetServiceStatusResponseData	21
Table 14	Description of DeviceManagementService.GetAllSubdeviceInformationResponse	22
Table 15	Description of DeviceManagementService.GetAllSubdeviceInformationResponseData	22
Table 16	Description of DeviceManagementService.SubdeviceInformationStructure	22
Table 17	Description of DeviceManagementService.GetDeviceStatusInformationResponse	23
Table 18	Description of DeviceManagementService.GetDeviceStatusInformationResponseData	23
Table 19	Description of DeviceManagementService.DeviceStatusInformationStructure	23



Table 20	Description of DeviceManagementService.DeviceStatusStructure	23
Table 21	Description of DeviceManagementService.GetAllSubdeviceStatusInformationResponse	24
Table 22	Description of DeviceManagementService.GetAllSubdeviceStatusInformationResponse Data	24
Table 23	Description of DeviceManagementService.SubdeviceStatusInformationStructure	24
Table 24	Description of DeviceManagementService.GetAllSubdeviceErrorMessagesResponse	25
Tabelle 25	Description of DeviceManagementService.GetAllSubdeviceErrorMessagesResponseData	25
Table 26	Description of DeviceManagementService.SubdeviceErrorMessagesStructure	25
Table 27	Description of DeviceManagementService.InstallUpdateRequestStructure	26
Table 28	Description of DeviceManagementService.InstallUpdateResponseStructure	26
Table 29	Description of UpdateAcceptEnumeration	27
Table 30	Description of DeviceManagementService.RetrieveUpdateStateRequestStructure	28
Table 31	Description of DeviceManagementService.RetrieveUpdateStateResponseStructure	28
Table 32	Description of DeviceManagementService.UpdateStateDataStructure	28
Table 33	Description of UpdateStatusEnumeration	29
Table 34	Description of DeviceManagementService.GetUpdateHistoryResponseStructure	29
Table 35	Description of DeviceManagementService.UpdateHistoryStructure	29
Table 36	Description of DeviceManagementService.UpdateHistoryEntryStructure	29
Table 37	Description of DeviceManagementService.FinalizeUpdateRequestStructure	30
Table 38	Description of DeviceManagementService.FinalizeUpdateResponseStructure	30

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## Regelwerke – Normen und Empfehlungen / References

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- (2) CEN/TS 13149-8      Öffentlicher Verkehr - Planungs- und Steuerungssysteme für Straßenfahrzeuge - Teil 8: Physikalische Schicht für IP-Kommunikation; Englische Fassung CEN/TS 13149-8:2013
- (3) VDV 301-2-0          IBIS-IP Beschreibung der Dienste / Service description  
Basisdienste / Base Services  
DeviceManagementService, SystemManagementService,  
SystemDocumentationService V2.0, 02/2018
- (4) VDV 301-2-1          IBIS-IP Beschreibung der Dienste / Service description  
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Common data structures and enumerations, 05/2017
- (5) VDV 301-1            IBIS-IP- Teil 1: Systemarchitektur / System architecture  
V1.0, 01/2014

Die IBIS-IP XSD-Dateien stehen unter [www.vdv.de/ip-kom-oev.aspx](http://www.vdv.de/ip-kom-oev.aspx) zum Download bereit.

The IBIS-IP XSD files are available for download at [www.vdv.de/ip-kom-oev.aspx](http://www.vdv.de/ip-kom-oev.aspx).

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