Using the UTMC ANPR protocol

A UTMC Technical Guide
Library reference ***UTMC-TR007.002***

24 October 2011

Cover + 31 pages

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1 Introduction

1.1 About this document

1.1.1 UTMC is a UK-led initiative which provides and maintains a technical framework for traffic management and related systems. It is geared to producing open specifications geared to the needs of real world projects, delivered through an efficient and innovative supply market. UTMC specifications are endorsed by the UK Department for Transport and are published on the UTMC website at: http://www.utmc.uk.com.

1.1.2 To help users get the best out of the UTMC Technical Specification, we provide a set of guidance documents addressing some of the associated issues, ranging from non technical aspects such as procurement policy and operations, to technical aspects such as database design and communications network configuration.

1.1.3 This document is a guidance document primarily for developers, and is concerned with expanding on the technical implementation of UTMC protocols within an ANPR system.

1.2 Status of this document

1.2.1 This document is based on the previous version, TR007 001b, produced by the UTMC ANPR Working Group (2009-2010).

1.2.2 UTMC gratefully acknowledges the work of the members of the Working Group in compiling this guidance and the associated elements of the Technical Specification.

1.3 Context

1.3.1 This protocol is for use by ANPR cameras when connecting to UTMC systems as used by numerous authorities across the UK, with the goal of achieving interoperability between suppliers. Although the primary aim has been to provide standardized ANPR data for journey time systems, the scope of the protocol includes the provision of additional data meeting NAAS requirements (for example images) to satisfy Police requirements in the event that Local Authorities and the Police wish to share cameras.

1.3.2 The UTMC ANPR protocol was developed within the following framework:

- This standard utilises non-proprietary elements and is based on XML. It is recognised that the communications costs associated with the use of XML may be higher at present than those for a less verbose protocol. However, it is hoped that the ease of use and the wide support of XML will lead to the ready exploitation of a forward-looking XML based open standard, particularly in the light of ongoing reductions in communication costs.

- The focus of this protocol is Camera to Instation and Instation to Camera communications. In parallel, a set of attribute extensions have been developed for the Common Database CCTV Data Object, which allow the Instation to add distilled ANPR data to the CDB. This document does not deal with Instation to Instation Journey Time Exchange.

- This protocol should be formed with some consideration of existing protocols and guidance – UTMC, Datex and possibly NTCIP.

- This protocol should be scalable. Elements such as image transfer may not be a requirement of all users. The protocol should be developed in a way to ensure that such additions are optional.

1.4 Web service interfaces

1.4.1 All web interfaces are SOAP (Simple Object Access Protocol) based and are described in WSDL (Web Services Description Language).

1.4.2 To summarise the Instation WSDL, the interface allows the camera to send XML element: <CameraToInstation> and in reply receives an XML element: <InstationToCamera>.

1.4.3 The camera WSDL allows the Instation to send XML element: <InstationToCamera>.

1.4.4 It should be noted that SOAP headers are not included in the UTMC ANPR WSDL files (camera.wsdl and instation.wsdl) or in the xml excerpts shown below. SOAP headers must therefore be generated for any SOAP-compliant implementation.

1.4.5 Both <CameraToInstation> and <InstationToCamera> elements have a mandatory version number attribute:

- SchemaVersion, indicating the version number of the element which contains it (SchemaVersion is a string containing dot-separated numbers (starting with 1.0). The first digit indicates a major revision, the second indicates updates to that revision.)

1.4.6 The xml excerpts shown below relate to V1.2 of the UTMC ANPR Protocol.

2 Camera to Instation

2.1 Introduction

2.1.1 This XML element is intended for transmitting all information from Camera to Instation. It allows for sending: plate data, ANPR and machine diagnostics, proprietary logs, images, current Camera configuration and request for configuration in any combination.

2.1.2 The option must be provided to use Gzip compression of the entire Camera to Instation element. The protocol does not provide for enabling or disabling this feature - it must be enabled or disabled by a commissioning engineer, either on-site or via a remotely connected engineering application.

2.1.3 Mandatory elements are:

- CameraID to identify the Camera
- TimeStamp which is the date and time of message creation

2.1.4 For clarity, each type of information payload is discussed separately; however messages may use any combination of elements.

2.1.5 All array elements include an optional attribute "ManufacturerSpecific" (not shown in the examples) which enables the communication of additional information outside the scope of the pre-defined attributes.

2.2 PlateRead

2.2.1 An optional array of plate read results may be included. For each entry in the array, the following are mandatory:

- InstanceID to identify the plate read event;
- TimeStamp which is the date and time of the sighting;
- LaneID representing the lane in which the plate was travelling;
- VehicleDirection representing the direction the vehicle was travelling in the lane;
- PlateNotRead, a flag to indicate a vehicle has been detected but no plate read.

2.2.2 The following is an example message containing a single plate read.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CameraToInstation xmlns=" http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <CameraID>0</CameraID>
    <TimeStamp>2009-06-29T12:01:59.377+01:00</TimeStamp>
    <PlateReadArray>
        <PlateRead>
            <InstanceID>0</InstanceID>
            <TimeStamp>2009-06-29T12:01:59.379+01:00</TimeStamp>
            <TimeStampError>5</TimeStampError>
            <LaneID>0</LaneID>
            <VehicleDirection>U</VehicleDirection>
            <XYType>OSGB</XYType>
            <XCoord>123456.7</XCoord>
            <YCoord>654321.0</YCoord>
            <PlateNotRead>false</PlateNotRead>
            <VRN>A123BCD</VRN>
            <VRNConfidence>85</VRNConfidence>
```

```
                <Tag>1234</Tag>
                <TagConfidence>90</TagConfidence>
                <Classification>1</Classification>
                <Country>GBR</Country>
                <Make>Ford</Make>
                <Model>Focus</Model>
                <Colour>Red</Colour>
                <Velocity>50</Velocity>
                <VelocityError>5</VelocityError>
            </PlateRead>
        </PlateReadArray>
</CameraToInstation>
```

2.2.3 Where the Camera has been configured to send plate reads immediately, the <PlateReadArray> element will only contain a single <PlateRead> element. Where the Camera is configured to send batches of plate reads, multiple <PlateRead> elements will be present. It is mandatory that each <PlateRead> element contains at least one of <VRN> or <Tag>.

2.2.4 See section 4 for an explanation of the hashing algorithm which is used to convert the <VRN> element to a hashed tag (the <Tag> element) for the purposes of journey time or origin-destination applications.

2.2.5 These elements are described in more detail in Appendix 1.

2.3 ANPR diagnostics

2.3.1 An optional array of ANPR diagnostics may be included (one entry per lane). For each entry in the array, the following are mandatory:

- TimeStamp which is the date and time of end of the diagnostic period;
- DiagnosticType representing whether the entry is a routine diagnostic or an alarm;

2.3.2 The following is an example message containing all defined ANPR Diagnostic objects:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CameraToInstation xmlns=" http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <CameraID>0</CameraID>
    <TimeStamp>2009-06-29T12:01:59.377+01:00</TimeStamp>
    <ANPRDiagnosticArray>
        <ANPRDiagnostic>
            <TimeStamp>2009-06-29T12:01:59.379+01:00</TimeStamp>
            <DiagnosticType>routineDiagnostic</DiagnosticType>
            <LaneID>0</LaneID>
            <MeanVRNConfidence>82</MeanVRNConfidence>
            <MeanTagConfidence>85</MeanTagConfidence>
            <MeanPlateContrast>56</MeanPlateContrast>
            <MeanCharacterHeight>15</MeanCharacterHeight>
            <MeanHorizontalAngle>8</MeanHorizontalAngle>
            <MeanVerticalAngle>2</MeanVerticalAngle>
            <MeanTrajectoryOffset>2</MeanTrajectoryOffset>
            <MeanTrajectoryAngle>11</MeanTrajectoryAngle>
            <MeanVelocity>45</MeanVelocity>
            <MeanVelocityError>4</MeanVelocityError>
```

```
                <PlateToTriggerRatio>90</PlateToTriggerRatio>
                <PlatesNoCountryRatio>3</PlatesNoCountryRatio>
                <PlatesTowardsRatio>43</PlatesTowardsRatio>
                <PlatesAwayRatio>45</PlatesAwayRatio>
                <MeanIRLevel>53</MeanIRLevel>
                <MeanExposure>350</MeanExposure>
                <MeanGain>-10</MeanGain>
            </ANPRDiagnostic>
        </ANPRDiagnosticArray>
</CameraToInstation>
```

2.3.3 These elements are described in more detail in Appendix 2.

2.4 Machine diagnostics

2.4.1 An optional array of machine diagnostics (describing hardware, software and communications performance) may be included. For each entry in the array, the following are mandatory:

- TimeStamp which is the date and time of the end of the diagnostic period;
- DiagnosticType representing whether the entry is a routine diagnostic or an alarm;
- HostName representing the host to which communications diagnostics relate

2.4.2 The following is an example message containing all proposed Machine Diagnostic objects:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CameraToInstation xmlns=" http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <CameraID>0</CameraID>
    <TimeStamp>2009-06-29T12:01:59.377+01:00</TimeStamp>
    <MachineDiagnosticArray>
        <MachineDiagnostic>
            <TimeStamp>2009-06-29T12:01:59.379+01:00</TimeStamp>
            <DiagnosticType>routineDiagnostic</DiagnosticType>
            <MeanCPUTemperature>56</MeanCPUTemperature>
            <MeanTotalCurrent>120</MeanTotalCurrent>
            <MeanIlluminatorTemp>70</MeanIlluminatorTemp>
            <MeanIlluminatorCurrent>90</MeanIlluminatorCurrent>
            <IlluminatorUsage>123</IlluminatorUsage>
            <MeanIlluminatorOutput>90</MeanIlluminatorOutput>
            <LastResetTime>2009-06-29T12:01:59.379+01:00</LastResetTime>
            <NoOfHardwareErrors>0</NoOfHardwareErrors>
            <MeanSignalStrength>-36</MeanSignalStrength>
            <HostName>192.168.1.1</HostName>
            <MeanCommsLag>23</MeanCommsLag>
            <WorstCommsLag>50</WorstCommsLag>
            <NoOfCommsResends>3</NoOfCommsResends>
            <NoOfCommsFailures>1</NoOfCommsFailures>
            <NoOfCommsReconnects>2</NoOfCommsReconnects>
            <MeanSyncDifference>40</MeanSyncDifference>
            <WorstSyncDifference>123</WorstSyncDifference>
            <LastSyncTime>2009-06-29T12:01:59.379+01:00</LastSyncTime>
            <SupplyVoltage>98</SupplyVoltage>
            <TamperAlarm>normal</TamperAlarm>
```

```
            </MachineDiagnostic>
        </MachineDiagnosticArray>
</CameraToInstation>
```

2.4.3 These elements are described in more detail in Appendix 3.

2.5 Logs

2.5.1 An optional array of log messages (representing logged events such as power up, configuration change or communication error) may be included. For each entry in the array, the following is mandatory:

- TimeStamp which is the date and time relating to the log message;

2.5.2 The following is an example message outlining the format of a Log Array:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CameraToInstation xmlns=" http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <CameraID>0</CameraID>
    <TimeStamp>2009-06-29T12:01:59.377+01:00</TimeStamp>
    <LogArray>
        <Log>
            <TimeStamp>2009-06-29T12:01:59.379+01:00</TimeStamp>
            <InstanceID>0</InstanceID>
            <LogMessage>System Restart</LogMessage>
        </Log>
    </LogArray>
</CameraToInstation>
```

2.5.3 The <LogArray> element may contain any number of <Log> elements. LogMessage elements may contain XML or plain text in proprietary format, as long as XML formatting rules are strictly followed.

2.6 Images

2.6.1 An optional array of camera images may be included. For each entry in the array, the following are mandatory:

- TimeStamp which is the date and time at which the image was captured;
- ImageType representing the type of the image e.g. plate patch, ANPR image etc;

2.6.2 The following is an example message containing binary images. Five types of image can be sent: PlatePatch, ANPR Image, Overview Image, Context Image or Context Overview Image:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CameraToInstation xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <CameraID>0</CameraID>
    <TimeStamp>2009-06-29T12:01:59.377+01:00</TimeStamp>
    <ImageArray>
        <Image>
            <InstanceID>0</InstanceID>
            <TimeStamp>2009-06-29T12:01:59.379+01:00</TimeStamp>
```

```
            <VRN>A123BCD</VRN>
            <LaneID>0</LaneID>
            <ImageType>platePatch</ImageType>
            <ImageFormat>jpeg</ImageFormat>
            <BinaryImage>[IMAGE DATA]</BinaryImage>
        </Image>
        <Image>
            <InstanceID>0</InstanceID>
            <TimeStamp>2009-06-29T12:01:59.379+01:00</TimeStamp>
            <VRN>A123BCD</VRN>
            <LaneID>0</LaneID>
            <ImageType>ANPRImage</ImageType>
            <ImageFormat>gif</ImageFormat>
            <BinaryImage>[IMAGE DATA]</BinaryImage>
        </Image>
        <Image>
            <InstanceID>0</InstanceID>
            <TimeStamp>2009-06-29T12:01:59.379+01:00</TimeStamp>
            <VRN>A123BCD</VRN>
            <LaneID>0</LaneID>
            <ImageType>overviewImage</ImageType>
            <ImageFormat>tiff</ImageFormat>
            <BinaryImage>[IMAGE DATA]</BinaryImage>
        </Image>
    </ImageArray>
</CameraToInstation>
```

2.6.3 These elements are described in more detail in Appendix 4.

2.6.4 It should be noted that InstanceID is not required for an ad-hoc context image or any image that may be requested from the Instation where there is no association with a vehicle, and therefore no VRN has been collected with a corresponding Instance ID. However, where an image relates to a plate read, the InstanceID for the plate read is included in the image attributes.

2.7 Camera and Configuration

2.7.1 Optional Camera and Configuration elements may be included in response to a ConfigRequest issued by the Instation via the InstationToCamera element. The following is mandatory in the Camera element:

- HardwareUniqueID which represents a globally unique identifier for the camera

2.7.2 At least one Lane element per camera is mandatory. The following are mandatory in each Lane element:

- LaneID representing the lane relative to the camera to which the lane config applies
- LaneNumber representing the lane position in the carriageway
- LaneDirectionTypeID representing the direction of travel of the carriageway lane
- NormalVehicleDirection - whether vehicles normally travel towards or away from the camera

2.7.3 The following is an example message outlining a Camera and Configuration response to an Instation ConfigRequest, which includes both Camera and Configuration elements:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CameraToInstation xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <CameraID>0</CameraID>
    <TimeStamp>2009-06-29T12:01:59.377+01:00</TimeStamp>
    <Camera>
        < HardwareUniqueID>CA_Traffic:Evo8:7205/0219</ HardwareUniqueID>
        <ShortDescription>My Short description</ShortDescription>
        <LongDescription>My long description</LongDescription>
        <XYType>OSGB</XYType>
        <XCoord>123456.7</XCoord>
        <YCoord>654321.0</YCoord>
        <Height>3.5</Height>
        <TypeID>7</TypeID>
        <MobileCamera>false</MobileCamera>
        <SoftwareVersion>2.1.1</SoftwareVersion>
        <LaneArray>
            <Lane>
                <LaneID>0</LaneID>
                <LaneNumber>1</LaneNumber>
                <LaneDirectionTypeID>5</LaneDirectionTypeID>
                <NormalVehicleDirection>towards</NormalVehicleDirection>
            </Lane>
        </LaneArray>
    </Camera>
    <Configuration>
        <HostName>HOST1</HostName>
        <SendVRNs>true</SendVRNs>
        <SendTags>false</SendTags>
        <SendPlatePatches>false</SendPlatePatches>
        <SendANPRImages>false</SendANPRImages>
        <SendOverviewImages>false</SendOverviewImages>
        <SendPlatesNotRead>false</SendPlatesNotRead>
        <SendANPRDiagnostics>true</SendANPRDiagnostics>
        <SendMachineDiagnostics>true</SendMachineDiagnostics>
        <SendIncrementalLog>true</SendIncrementalLog>
        <SendPeriodicContextImage>true</SendPeriodicContextImage>
        <UseReportingOffset>false</UseReportingOffset>
        <SendHeartbeat>true</SendHeartbeat>
        <StreamPlates>false</StreamPlates>
        <HeartbeatInterval>300</HeartbeatInterval>
        <PlateSendInterval>60</PlateSendInterval>
        <ReportingOffset>15</ReportingOffset>
        <ANPRDiagsSendInterval>1800</ANPRDiagsSendInterval>
        <MachineDiagsSendInterval>3600</MachineDiagsSendInterval>
        <IncrementalLogInterval>600</IncrementalLogInterval>
        <ContextImagePeriod>900</ContextImagePeriod>
        <MaxPlatesToSend>200</MaxPlatesToSend>
        <MinANPRDiagnosticSamples>10</MinANPRDiagnosticSamples>
        <CurrentDateTime>2009-06-29T12:01:59.379+01:00</CurrentDateTime>
    </Configuration>
</CameraToInstation>
```

2.7.4 Elements that are part of the <Camera> element are not configurable by the instation and should be set up on installation of the physical camera by manufacturer specific means (for example pre-configured at the factory or entered by the commissioning engineer).

2.7.5 A number of different lanes may be configured for one camera, however note that the <Configuration> element has no attributes which are lane-specific.

2.7.6 In the <Camera> element, at least one <Lane> element is mandatory. It is anticipated that <Lane> attributes will be entered into the camera by the commissioning engineer – these are not downloadable from the Instation.

2.7.7 Where there are attributes in the <Configuration> element which are not supported by a particular camera, the camera may omit these from the response.

2.7.8 A camera must maintain separate Configuration objects for each host. It will only accept the Configuration for a particular host from that host itself, and will only push a Configuration to the host to which it applies.

2.7.9 The <Camera>, <Lane>, and <Configuration> elements are described in more detail in Appendix 5.

2.8 Configuration request

2.8.1 The following is an example message outlining a request by the Camera for an update of its current Configuration:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CameraToInstation xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <CameraID>0</CameraID>
    <TimeStamp>2009-06-29T12:01:59.377+01:00</TimeStamp>
    <ConfigRequest/>
</CameraToInstation>
```

2.8.2 This is an empty element used by the Camera for requesting the current configuration from the Instation, for example on Camera startup.

2.8.3 The ConfigRequest is directed to a particular host, which will return the Configuration relating only to that host. Where a camera is configured to report to multiple hosts, it is not permitted for one host to have the ability to change the Configuration of another.

2.9 Heartbeat message

2.9.1 The following is an example message outlining a heartbeat, which comprises a CameraToInstation element which is empty apart from the mandatory CameraID and Timestamp attributes:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<CameraToInstation xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <CameraID>0</CameraID>
    <TimeStamp>2009-06-29T12:01:59.377+01:00</TimeStamp>
</CameraToInstation>
```

2.9.2 Where a Camera is connected via a network which does provide a fixed IP address (for example some mobile networks), it may not be possible for the Instation to initiate a data transaction with a Camera (it may be impossible to determine the IP address allocated by the network). The Camera should therefore be configured periodically to send a 'Heartbeat' message to allow the Instation to respond with a message to the Camera. This heartbeat message is essentially an empty message which must be sent if no other messages have been sent within a configurable period of time (<HeartbeatInterval>).

3 Instation To Camera

3.1 Introduction

3.1.1 The <InstationToCamera> element is intended primarily for transmitting information from the Instation to the Camera in response to a SOAP call containing the <CameraToInstation> element. It allows for any combination of: a camera configuration, a configuration request, an image request or a log request to be sent. None of these elements is mandatory, hence the <InstationToCamera> element may also be sent empty to provide a receipt acknowledgement.

3.1.2 The option must be provided to use Gzip compression of the entire Instation to Camera element. The protocol does not provide for enabling or disabling this feature - it must be enabled or disabled by a commissioning engineer, either on-site or via a remotely connected engineering application.

3.1.3 Whereas this element is used in response to a <CameraToInstation> element, it mostly contains requests for data from the camera, for the reason that cameras are often connected via mobile networks where the Instation is unable to initiate a TCP/IP connection. Requests for data are therefore 'piggybacked' onto the acknowledgements sent by the Instation to the Camera.

3.1.4 Where the network connection allows the Instation to initiate a TCP/IP connection, the <InstationToCamera> element may also be transmitted on an ad-hoc basis as a SOAP call from the instation to the camera.

3.1.5 All array elements include an optional attribute "ManufacturerSpecific" (not shown in the examples) which enables the communication of additional information outside the scope of the pre-defined attributes.

3.2 Configuration

3.2.1 The Instation may push a new or revised configuration to the camera either at will or in response to a <ConfigRequest> from the camera. It is only possible to push that configuration which is specific to the sending host.

3.2.2 The following is an example message outlining a Configuration response to a camera ConfigRequest (none of the <Configuration> elements is mandatory):

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<InstationToCamera xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <Configuration>
        <HostName>HOST1</HostName>
        <SendVRNs>true</SendVRNs>
        <SendTags>false</SendTags>
        <SendPlatePatches>false</SendPlatePatches>
        <SendANPRImages>false</SendANPRImages>
        <SendOverviewImages>false</SendOverviewImages>
        <SendPlatesNotRead>false</SendPlatesNotRead>
        <SendANPRDiagnostics>true</SendANPRDiagnostics>
        <SendMachineDiagnostics>true</SendMachineDiagnostics>
        <SendIncrementalLog>true</SendIncrementalLog>
        <SendPeriodicContextImage>true</SendPeriodicContextImage>
        <UseReportingOffset>false</UseReportingOffset>
        <SendHeartbeat>true</SendHeartbeat>
        <StreamPlates>false</StreamPlates>
```

```
            <HeartbeatInterval>300</HeartbeatInterval>
            <PlateSendInterval>60</PlateSendInterval>
            <ReportingOffset>15</ReportingOffset>
            <ANPRDiagsSendInterval>1800</ANPRDiagsSendInterval>
            <MachineDiagsSendInterval>3600</MachineDiagsSendInterval>
            <IncrementalLogInterval>600</IncrementalLogInterval>
            <ContextImagePeriod>900</ContextImagePeriod>
            <MaxPlatesToSend>200</MaxPlatesToSend>
            <MinANPRDiagnosticSamples>10</MinANPRDiagnosticSamples>
            <CurrentDateTime>2009-06-29T12:01:59.379+01:00</CurrentDateTime>
        </Configuration>
    </InstationToCamera>
```

3.2.3 This is exactly the same <Configuration> element as used for the <CameraToInstation> child element for transmitting the camera's current configuration.

3.2.4 The protocol does not provide for the addition of new hosts to the camera - these must be added or removed by a commissioning engineer, either on-site or via a remotely connected engineering application.

3.2.5 Where there are attributes in the <Configuration> element which are not supported by a particular camera, they will be ignored by the camera.

3.3 Log request

3.3.1 The Instation may request log records from the camera for a specific time period. In the <LogRequest> element, the following (which are the only attributes) are mandatory:

- StartTime which is the date and time at which log records should start;
- EndTime which is the date and time at which log records should end.

3.3.2 The following is an example message containing a response request from the Instation for provision of a Log by the camera:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<InstationToCamera xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <LogRequest>
        <StartTime>2008-11-14T10:50:30.952Z</StartTime>
        <EndTime>2008-11-14T10:50:30.952Z</EndTime>
    </LogRequest>
</InstationToCamera>
```

3.4 Configuration request

3.4.1 The following is an example message outlining a request by the Instation for a camera to upload its current Configuration:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<InstationToCamera xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <ConfigRequest/>
</InstationToCamera>
```

3.4.2 The <ConfigRequest> is an empty element identical to the same child element of the <CameraToInstation> element. (see 2.8).

3.4.3 The <ConfigRequest> is issued by a particular host, and the camera will return only the Configuration relating only to that host.

3.5 Image request

3.5.1 The Instation may request (retrospectively) images related to plate reads which have been stored in a camera. It may also request ad-hoc context images which are not connected with plate reads. There are four different classes of request, depending on the criteria which the Instation wishes to use to identify the required images:

- TimeRangeImageRequest: request images from a specific time period
- PriorVRNImageRequest: request a specific quantity of the most recent images
- InstanceSetImageRequest: request the images for a specific list of plate reads
- ContextImageRequest: request immediate images from one or more camera sensors

3.5.2 Only one of these ImageRequest classes should be used per <InstationToCamera> response, otherwise the instation will not know to which request the images sent by the camera relate.

3.5.3 The following is an example outlining a request from an Instation to a camera requesting the provision of images from a specific time period:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<InstationToCamera xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <TimeRangeImageRequest>
        <StartTime>2008-11-14T10:50:30.952Z</StartTime>
        <EndTime>2008-11-14T10:50:30.952Z</EndTime>
        <ImageTypeArray>
            <ImageType>platePatch</ImageType>
            <ImageType>overviewImage</ImageType>
        </ImageTypeArray>
    </TimeRangeImageRequest>
</InstationToCamera>
```

3.5.4 The following is an example outlining a request from an Instation to a camera requesting a specific quantity of recent images ending at a particular InstanceID:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<InstationToCamera xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <PriorVRNImageRequest>
        <NoOfPriorVRNs>10</NoOfPriorVRNs>
        <EndInstanceID>123456</EndInstanceID>
        <ImageTypeArray>
            <ImageType>platePatch</ImageType>
            <ImageType>overviewImage</ImageType>
        </ImageTypeArray>
    </PriorVRNImageRequest>
</InstationToCamera>
```

3.5.5 The following is an example outlining a request from an Instation to a camera requesting the provision of images for a specific set of plate reads:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<InstationToCamera xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <InstanceSetImageRequest>
        <InstanceIDArray>
            <InstanceID>123456</InstanceID>
            <InstanceID>123454</InstanceID>
            <InstanceID>123452</InstanceID>
        </InstanceIDArray>
        <ImageTypeArray>
            <ImageType>platePatch</ImageType>
            <ImageType>overviewImage</ImageType>
        </ImageTypeArray>
    </InstanceSetImageRequest>
</InstationToCamera>
```

3.5.6 The following is an example outlining a request from an Instation to a camera requesting immediate context images:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<InstationToCamera xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
    <ContextImageRequest>
        <ImageTypeArray>
            <ImageType>contextImage</ImageType>
            <ImageType>contextOverviewImage</ImageType>
        </ImageTypeArray>
    </ContextImageRequest>
</InstationToCamera>
```

3.5.7 These elements are described in more detail in Appendix 6.

3.6 Acknowledgement

3.6.1 The following is an example message outlining an acknowledgement, which comprises an <InstationToCamera> element that is empty:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<InstationToCamera xmlns="http://utmc.uk.com/anpr/schema_1-2" SchemaVersion="1.2">
</InstationToCamera>
```

3.6.2 Where the Instation receives a <CameraToInstation> message and does not require any further information from the camera, the <InstationToCamera> response will be an empty element which provides the camera with an acknowledgment that its transmission has been received.

4 Tag Hashing algorithm

4.1 About the algorithm

4.1.1 Journey time systems based on ANPR require cameras to recognise a plate at two or more locations and to return the recognised plate details to the instation. Although the full plate registration number can be returned to the instation for character by character matching, this may be undesirable in some circumstances. Additionally, to maintain driver and vehicle anonymity, it may be desirable to encrypt or otherwise change the plate string such that the actual registration number cannot be recovered.

4.1.2 ANPR systems are never 100% accurate. Read errors do occur. It is desirable to minimise the effect on the system of these read errors. For example the character D may be read correctly at one location and then the same character may be read as an O at a subsequent location.

4.1.3 The hashing algorithm firstly reduces the possible effect of plate read errors by replacing any characters likely to be confused with one another by a single character. So for example any occurence of O, D, 0 or Q in a plate is replaced with the character O. The following table lists all such substitutions:

ANPR reads character	Reported as
O D 0 Q	O
I 1	I
S 5	S
V Y	V
3 8 B	3
2 Z	2
E F	E
G C	G
H M N W	H

4.1.4 The resultant plate string is then hashed down to a binary number of 24 bits. The hash algorithm chosen is "one_at_a_time_hash". This algorithm has been chosen after reviewing the performance of a large number of algorithms over a database of about 100,000 UK plates and selecting the algorithm which provided the best distribution of hash values.

4.1.5 The "one_at_a_time_hash" hash algorithm was developed by Bob Jenkins. The original reference for the algorithm is: http://www.burtleburtle.net/bob/hash/doobs.html

4.2 Example

4.2.1 Example code (C language) for character substitution and the hash process is shown below.

```
static const char *mixups[] =
{
    "OD0Q", "I1", "S5", "VY", "38B", "2Z", "EF", "GC", "HMNW",
};
#define    NMIXUPS    9

void merge_ambiguous_characters(char *plate)
{
short  i;
char   *cp;

    while(*plate)
    {
        for(i=0; i<NMIXUPS; ++i)
        {
            cp = mixups[i];
            if(ismember(*plate, cp))
            {
                *plate = *cp;
            }
        }
        ++plate;
    }
}


// this function returns the 24 bit hash value directly

unsigned long hash(const char *plate)
{
unsigned   len;
unsigned   hash, i;
const int  hashbits = 24;
char       merge_plate[12];
#define    hashsize(n) ((unsigned)1<<(n))
#define    hashmask(n) (hashsize(n)-1)

    strcpy(merge_plate,plate);
        merge_ambiguous_characters(merge_plate);
    len = strlen(merge_plate);
    for (hash=0, i=0; i<len; ++i)
    {
        hash += merge_plate[i];
        hash += (hash << 10);
        hash ^= (hash >> 6);
    }
    hash += (hash << 3);
    hash ^= (hash >> 11);
    hash += (hash << 15);
    return (hash & hashmask(hashbits));
}
```

Appendix 1 PlateRead Element

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
InstanceID	DYNAMIC	A unique plate reference number for this camera. InstanceID should be incremented for each plate read until the holding variable (typically INT32) wraps, i.e. it is not just unique for a particular timestamp.	uInteger	Y	Combined with CameraID and TimeStamp at Instation to form a unique EventID
TimeStamp	DYNAMIC	ISO 8601 UTC date/timestamp for time of sighting	DateTime	Y	1ms resolution For dateTime format, see section 3.2.7 (dateTime) of W3C document "XML Schema Part 2 - Datatypes Second Edition"
TimeStampError	DYNAMIC	Estimated worst case timestamp error in ms	Integer		
LaneID	DYNAMIC	Camera Lane to which configuration item(s) relate	uInteger	Y	0 is the leftmost lane in the camera field of view. This ID is relative to the camera, not the actual lanes of the carriageway
VehicleDirection	DYNAMIC	Whether vehicle travelling toward or away from camera	Enumerated	Y	e.g. towards, away, unknown. i.e. towards = front plate, away = rear plate
XYType	STATIC	Reference co-ordinate system for XY location	Enumerated		e.g. OSGB or WGS84 (NB OSGB refers to OSGB36 datum)
XCoord	STATIC	X co-ordinate of camera location	Float		e.g. Longitude or Easting (Degrees + decimal degrees for longitude)
YCoord	STATIC	X co-ordinate of camera location	Float		e.g. Latitude or Northing (Degrees + decimal degrees for latitude)
PlateNotRead	DYNAMIC	A vehicle has been detected, but a plate cannot be found or, if found, cannot be recognised	Boolean	Y	Allows an InstanceID to be generated and a PlateRead record to be sent where no plate has been read.
VRN	DYNAMIC	Recognised licence number	Character		No whitespace characters
VRNConfidence	DYNAMIC	Probability that licence number is correct	Percent		0 to 100%
Tag	DYNAMIC	Hashed value formed from VRN	uInteger		In the range 0 to 2^{24} - 1

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
TagConfidence	DYNAMIC	Probability that tag value is correct	Percent		0 to 100%
Classification	DYNAMIC	Class of the recognised vehicle e.g. car, van lorry	uInteger		Numeric values only representing a classification scheme determined by the user.
Country	DYNAMIC	ISO 3166-1 three character country code	Character		e.g. GBR, FRA, DEU
Make	DYNAMIC	Make of Vehicle (Manufacturer)	Character		
Model	DYNAMIC	Model of Vehicle	Character		May be text (e.g. Mondeo) or number (e.g. 520)
Colour	DYNAMIC	Colour of vehicle	Enumerated		See list of standard colours (table below)*
Velocity	DYNAMIC	Estimated vehicle speed in kph	uInteger		
VelocityError	DYNAMIC	Estimated velocity error (magnitude) in kph	uInteger		Mean of the magnitudes of the +ve and -ve error estimates at 95% confidence interval

* A standard set of colours is used as follows:

Red		Green		Dark Purple		Light Brown
Light Red		Light Green		Grey		Dark Brown
Dark Red		Dark Green		Light Grey		Magenta
Orange		Blue		Dark Grey		Turquoise
Light Orange		Light Blue		Gold		
Dark Orange		Dark Blue		Silver		
Yellow		Violet		White		
Light Yellow		Purple		Black		
Dark Yellow		Light Purple		Brown		

Appendix 2 ANPRDiagnostic Element

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
TimeStamp	DYNAMIC	ISO 8601 UTC date/timestamp for end of diagnostic period	DateTime	Y	1ms resolution
DiagnosticType	DYNAMIC	Whether a routine diagnostic or an alarm (warning or fault)	Enumerated	Y	Enumerated type having values "routineDiagnostic", "alarmWarningSet", "alarmWarningClear", "alarmFaultSet","alarmFaultClear"
LaneID	DYNAMIC	Camera Lane to which the Diagnostics relate	uInteger		0 is the leftmost lane in the camera field of view. This ID is relative to the camera, not the actual lanes of the carriageway
MeanVRNConfidence	DYNAMIC	Average Probability that licence number is correct	Percent		0 to 100%
MeanTagConfidence	DYNAMIC	Average Probability that tag value is correct	Percent		0 to 100%
MeanPlateContrast	DYNAMIC	Average plate patch contrast	Percent		0 = all black, 100 = all white
MeanCharacterHeight	DYNAMIC	Average VRN character height in pixels	uInteger		
MeanHorizontalAngle	DYNAMIC	Average character angle to horizontal in degrees	Integer		±90 degrees
MeanVerticalAngle	DYNAMIC	Average character angle to vertical in degrees	Integer		±90 degrees
MeanTrajectoryOffset	DYNAMIC	Average trajectory distance from image centre	Integer		As a percentage of the horizontal image size. -ve for left of centre, +ve for right of centre
MeanTrajectoryAngle	DYNAMIC	Average angle of trajectory to horizontal in degrees	WholeDegrees		Horizontal right to left is zero, increasing anti-clockwise to 360. Values between 180 and 360 for vehicles travelling away from camera.
MeanVelocity	DYNAMIC	Average estimated vehicle speed in kph	uInteger		
MeanVelocityError	DYNAMIC	Average velocity error at 95% confidence interval	uInteger		Value in kph (mean of velocity error magnitude estimates)
PlateToTriggerRatio	DYNAMIC	Ratio of plates recognised to objects detected	Percent		0 to 100%

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
PlatesNoCountryRatio	DYNAMIC	Ratio of plates with unidentified country to all plates	Percent		0 to 100%
PlatesTowardsRatio	DYNAMIC	Ratio of plates towards camera to total plates	Percent		0 to 100%
PlatesAwayRatio	DYNAMIC	Ratio of plates away from camera to total plates	Percent		0 to 100%
MeanIRLevel	DYNAMIC	Average illuminator output level (percentage of max)	Percent		For frames selected for plate recognition
MeanExposure	DYNAMIC	Average exposure time in microseconds	uInteger		For frames selected for plate recognition
MeanGain	DYNAMIC	Average camera gain in dB where max gain is 0dB	Integer		For frames selected for plate recognition

Appendix 3 MachineDiagnostic Element

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
TimeStamp	DYNAMIC	ISO 8601 UTC date/timestamp for end of diagnostic period	DateTime	Y	1ms resolution
DiagnosticType	DYNAMIC	Whether a routine diagnostic or an alarm (warning or fault)	Enumerated	Y	Enumerated type having values "routineDiagnostic", "alarmWarningSet", "alarmWarningClear", "alarmFaultSet","alarmFaultClear"
MeanCPUTemp	DYNAMIC	Average processor board temperature in degrees	Integer		Can be +ve or -ve
MeanTotalCurrent	DYNAMIC	Average current drawn by camera including illuminator in mA	uInteger		Purpose: to identify reduction in illuminator current. Max value is 99,999mA
MeanIlluminatorTemp	DYNAMIC	Average illuminator temperature in degrees	Integer		Can be +ve or -ve
MeanIlluminatorCurrent	DYNAMIC	Average illuminator current in mA (during on-time)	uInteger		Max value is 99,999mA
IlluminatorUsage	DYNAMIC	Total illuminator usage (amps x hours) - cumulative	uInteger		As an indication of illuminator lifetime used
MeanIlluminatorOutput	DYNAMIC	Average illuminator light output as percentage of max when new	Integer		May be > 100%
LastResetTime	DYNAMIC	Date & Time of last CPU reset	DateTime		May be outside this diagnostic interval
NoOfHardwareErrors	DYNAMIC	Number of hardware errors detected	uInteger		
MeanSignalStrength	DYNAMIC	Average signal strength (wireless comms) in dB	Integer		Range is -999dB to 0dB
HostName	DYNAMIC	Name of host to which diagnostics relate	Character	Y	IP address or DNS name
MeanCommsLag	DYNAMIC	Average "round trip" communications delay in ms	uInteger		
WorstCommsLag	DYNAMIC	Worst case "round trip" communications delay in ms	uInteger		
NoOfCommsResends	DYNAMIC	Number of messages re-sent	uInteger		e.g. After failure to open host port
NoOfCommsFailures	DYNAMIC	Number of messages deleted from send buffer after repeated re-send failures	uInteger		
NoOfCommsReconnects	DYNAMIC	Number of reconnections to wireless network	uInteger		

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
MeanSyncDifference	DYNAMIC	Average time correction upon re-synchronisation in ms	Integer		This is a signed value, where a negative difference means the camera clock was fast, and a positive difference means it was slow.
WorstSyncDifference	DYNAMIC	Worst case time correction upon re-synchronisation in ms	Integer		This is a signed value, where a negative difference means the camera clock was fast, and a positive difference means it was slow.
LastSyncTime	DYNAMIC	Date & Time of last successful re-synchronisation	DateTime		May be outside this diagnostic interval
SupplyVoltage	DYNAMIC	Percentage of nominal system SELV supply voltage	Integer		May be >100%
TamperAlarm	DYNAMIC	Indication of unauthorised access to the equipment	Enumerated		Has 3 enumerated values: "normal", "enclosureBreachAlarm", "unauthorisedCommunicationAlarm"

Appendix 4 Image Element

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
InstanceID	DYNAMIC	Unique reference number for this camera to VRN record for a plate in the image	uInteger		
TimeStamp	DYNAMIC	ISO 8601 UTC date/timestamp	DateTime	Y	1ms resolution
VRN	DYNAMIC	Recognised licence plate number	Character		No whitespace characters. Allows images to be transmitted belatedly without the Host needing to refer to a database table referenced by InstanceID in order to associate VRN with images.
LaneID	DYNAMIC	Camera Lane to which image relates	uInteger		0 is the leftmost lane in the camera field of view. This ID is relative to the camera, not the actual lanes of the carriageway
ImageType	DYNAMIC	Whether the image is: a Plate patch (a close-cropped image of the plate as used for recognition) an ANPR image (the full image from which the plate patch has been taken) an Overview image (a visible image of the vehicle to which the plate read relates) a Context image (an uncropped image not related to a plate read) For cameras having separate ANPR and Overview sensors, context images by default relate to the ANPR sensor, but context images from the Overview sensor are also handled.	Enumerated	Y	Format: either "platePatch", "ANPRImage", "overviewImage", “contextImage” (from ANPR sensor) or “contextOverviewImage” (from Overview sensor).
ImageFormat	DYNAMIC	Encoding format of the image e.g. jpeg, tiff	Enumerated		Enumerated type having values "fits", "g3fax", "gif", "ief", "jp2", "jpeg", "jpm", "jpx", "t38", "tiff", "tiff-fx". (These formats are recognised MIME media types maintained in the IANA protocol registry: www.iana.org/assignments/media-types/image/).
BinaryImage	DYNAMIC	Jpeg image base-64 encoded	Binary		

Appendix 5 Camera Configuration Elements

A5.1 Camera Element

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
CameraID	STATIC	Unique identifier for the camera within a system	Character	Y	Local to Instation/Database Cross-reference to definition unique within a system can be compared in use to a "local IP Address"
HardwareUniqueID	STATIC	Globally unique identifier for the camera	Character	Y	Variable length up to 256 characters. Comprises three colon-separated fields i.e. "ManufacturerName:Model:FreeText". Each field any length with no whitespace allowed. ManufacturerName is mandatory, Model is optional - if null is signified by consecutive colons "ManufacturerName::FreeText". Strings must be alphanumeric and may include punctuation marks except colon.
ShortDescription	STATIC	Brief description of camera location	Character		
LongDescription	STATIC	Detailed description of camera location	Character		
XYType	STATIC	Reference co-ordinate system for XY location	Enumerated		e.g. OSGB or WGS84 (NB OSGB refers to OSGB36 datum)
XCoord	STATIC	X co-ordinate of camera location	Float		e.g. Longitude or Easting Degrees + decimal degrees for longitude
YCoord	STATIC	Y co-ordinate of camera location	Float		e.g. Latitude or Northing Degrees + decimal degrees for latitude
Height	STATIC	Height of camera above local ground level	Float		Measured in metres e.g. Height above Lowest road surface in multi-level junction

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
TypeID	STATIC	Type of equipment from generic list	uInteger		Generic ANPR = 5, IR = 6, IR+colour = 7, colour = 8
MobileCamera	STATIC	Whether the camera is mobile or fixed	Boolean		Assume fixed if attribute is absent
SoftwareVersion	STATIC	Software version number of the application generating the machine diagnostics (manufacturer specific)	Character		e.g. 3.5.15.72

A5.2 Lane Element

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
LaneID	STATIC	Camera Lane to which configuration item(s) relate	uInteger	Y	0 is the leftmost lane in the camera field of view This ID is relative to the camera, not the actual lanes of the carriageway
LaneNumber	STATIC	Position of the Lane in relation to the total number of lanes in the carriageway	uInteger	Y	In the range 0 to 99 Lane 0 is the first lane on the left in the direction of travel
LaneDirectionTypeID	STATIC	Direction of the carriageway lane in which vehicles normally travel (Note that this attribute relates to the direction taken by vehicles, not the direction in which the camera is pointing.)	uInteger	Y	e.g. 3 = clockwise, 4 = anticlockwise, 5 = northbound etc Format: see Direction_TypeID in CCTV ANPR Extensions Global Support Object
NormalVehicleDirection	STATIC	Direction relative to the camera in which vehicles normally travel	Enumerated	Y	e.g. towards, away, both "Both" applies for a single track road or tidal lane in a multi-lane road

A5.3 Configuration Element

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
HostName	CONFIG	Name of host to which configuration item(s) relate	Character		The fully qualified host URL or endpoint is set at time of commissioning.
SendVRNs	CONFIG	Whether to send VRN data (true/false)	Boolean		Following config items per host
SendTags	CONFIG	Whether to send Tag data (true/false)	Boolean		
SendPlatePatches	CONFIG	Whether to send plate patch images (true/false)	Boolean		
SendANPRImages	CONFIG	Whether to send full frame ANPR images (true/false)	Boolean		
SendOverviewImages	CONFIG	Whether to send full frame Overview images (true/false)	Boolean		
SendPlatesNotRead	CONFIG	Whether to send PlateRead records where PlateNotRead attribute is true	Boolean		See PlateRead attribute “PlateNotRead”
SendANPRDiagnostics	CONFIG	Whether to send ANPR diagnostics (true/false)	Boolean		
SendMachineDiagnostics	CONFIG	Whether to send machine diagnostics (true/false)	Boolean		
SendIncrementalLog	CONFIG	Whether to send an incremental log file (additions since last send)	Boolean		
SendPeriodicContextImage	CONFIG	Whether to send periodic context images (true/false)	Boolean		Note that in multiple sensor cameras, the sensor from which the context image is to be taken is determined by manufacturer-specific means. For example an image from the overview sensor may be returned during the day and an image from the ANPR sensor at night.

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
UseReportingOffset	CONFIG	Whether the camera should utilise the ReportingOffset (true/false)	Boolean		If false, permits the randomisation of reporting times by another method (for example by starting reporting intervals relative to the last camera power-on or reset) without the need to configure each camera with an individual ReportingOffset. Avoids cameras all reporting at the same time if no ReportingOffset is configured or a default value is assumed.
SendHeartbeat	CONFIG	Whether a generic wrapper should be sent periodically irrespective of whether there is data to send (true/false)	Boolean		Allows the sending of heartbeats to be turned on and off explicitly, rather than relying on whether a HeartbeatInterval has been configured.
StreamPlates	CONFIG	Whether to send a PlateRead record as soon as a plate is recognised (true/false)	Boolean		
HeartbeatInterval	CONFIG	Send at least one generic wrapper during this interval in seconds	uInteger		Maximum value 86400 seconds (=1 day)
PlateSendInterval	CONFIG	Reporting interval for sending VRN and/or tag data in seconds	uInteger		The end of the PlateSendInterval should be aligned with the time of transmission determined by the ReportingOffset, to ensure that the latest plate data is always reported as soon as possible.
ReportingOffset	CONFIG	Reporting time offset as percentage of appropriate send interval	Percent		Relative to a reporting interval commencing at midnight
ANPRDiagsSendInterval	CONFIG	Reporting interval for sending ANPR diagnostics in seconds	uInteger		
MachineDiagsSendInterval	CONFIG	Reporting interval for sending machine diagnostics in seconds	uInteger		
IncrementalLogInterval	CONFIG	Reporting interval for sending incremental log in seconds	uInteger		
ContextImagePeriod	CONFIG	Time interval at which a single context image is returned in seconds	uInteger		Single image only - not a batch

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
MaxPlatesToSend	CONFIG	Maximum number of VRNs/Tags to send per reporting interval	uInteger		Applies when StreamPlates is false - send up to this number of captured plates during a plate reporting interval.
MinANPRDiagnosticSamples	CONFIG	Minimum vehicles to be included in ANPR diagnostic averages	uInteger		Roll samples over from one interval to next
CurrentDateTime	CONFIG	DateTime value to set real time clock. The presence or absence of this attribute in the InstationToCamera response determines whether the Camera clock should be set or not.	DateTime		For dateTime format, see section 3.2.7 (dateTime) of W3C document “XML Schema Part 2 - Datatypes Second Edition“

Appendix 6 ImageRequest Elements

A6.1 TimeRangeImageRequest

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
StartTime	DYNAMIC	ISO 8601 UTC date/timestamp	DateTime	Y	1ms resolution
EndTime	DYNAMIC	ISO 8601 UTC date/timestamp	DateTime	Y	1ms resolution
ImageTypeArray	DYNAMIC	Array element containing 0 to n ImageTypes (list of the types of images required)	Character		See ImageType attribute of Image element (contextImage and contextOverviewImage will be ignored)

A6.2 PriorVRNImageRequest

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
NoOfPriorVRNs	DYNAMIC	Number of most recent VRN instances for which images are required	uInteger	Y	
EndInstanceID	DYNAMIC	The set of images to be sent should end with this InstanceID	uInteger		Used in conjunction with NoOfPriorVRNS to determine the latest InstanceID which should be sent in the set of images defined by these two attributes.
ImageTypeArray	DYNAMIC	Array element containing 0 to n ImageTypes (list of the types of images required)	Character		See ImageType attribute of Image element (contextImage and contextOverviewImage will be ignored)

A6.3 InstanceSetImageRequest

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
InstanceIDArray	DYNAMIC	InstanceArray element containing 0 to n Instance IDs for this camera of VRN records of the plates for which images are required	uInteger	Y	
ImageTypeArray	DYNAMIC	Array element containing 0 to n ImageTypes (list of the types of images required)	Character		See ImageType attribute of Image element (contextImage and contextOverviewImage will be ignored)

A6.4 ContextImageRequest

Attribute Name	Attribute Type	Description	Data Type	Man	Comments
ImageTypeArray	DYNAMIC	Array element containing 0 to n ImageTypes (list of the types of images required)	Character		See ImageType attribute of Image element (anything other than contextImage or contextOverviewImage will be ignored)