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| Date: | 2016.3.18 |  |  |  |
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C2 Pro

User manual of Cloud Communication interface

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| **No。** | **Version No。** | **Edit Date** | **Edit Content** | **Editor** | **Audit** | **Approval** |
| 1 | V1.0 | 2015-05-11 |  | Jacobs |  |  |
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## Chapter 1: Manual Description

### 1.1 The edit purpose

This interface document mainly provides the development and specification of the communication protocols between Cloud Time attendance software and the time attendance terminal.

### 1.2 Range of Application

This document is for Anviz time attendance terminal supporting Cloud Protocol based on Linux system, including C2pro/OA1000pro.

### 1.3 Term and Abbreviation

**Webservice**: To make the information from each isolated sites communicate and share each other ,so this interface is formed. Web Service use the unified and open standard of the internet, such as HTTP,XML,SOAP,WSDL etc, could be used in any environment(Windows, Linux) supporting these standards.

**SOAP:** Based on XML and HTTP, Simple Object Access Protocol by XML realizing message description, and then by HTTP realizing the message transfer.

**WSDL:**Web Service description language realize the loose coupling of the web services architecture

**3DES:** Also named “Triple DES”, is a mode of DES encryption algorithm, it use 3 secret keys of 56 bit to encrypt the data Three times

**SHA1：** A secure hash algorithm.

### 1.4 Proper Noun

**Terminal** :Based on SOAP protocol ,the terminal with Cloud Communication function,here it means C2pro.

**Server**: Communication Server with SOAP Service provided according to this protocol specification

**Privately-owned secret key**: The only one authentication secret key applied for to Anviz,

The key is the string with its length more than 16 bit, hereinafter referred to as the following document “Key”.

**Token:** Communication Dynamic secret key. Get the dynamic secret key with the timeliness by the privately-owned secret key, Generation ways: [< Second Chapter 1.4 Token generation>](#_2.4_Token值生成)

**Protocol Package,** make device No. , command word and key data combined together to the packet according to the protocol specifications

**Add-on Package,** one part of Protocol Package, it is key data for the communication contents.

**Instruction packet;** the returned protocol package from the server to the device which needs to be executed in the next step, and the format is same with the protocol package.

## Chapter 2: Interface Instruction

### 2.1 Access Way

1) According to the Protocol specifications, the server provides a unified, open-standard SOAP server.

2）Device working mode is SOAP Client.

3）Through the implementation of reporting, order response and the heartbeat packet, the device requests to the server, then the server receives this request to return the command that the device needs to perform the next time.

### 2.2 Data Security

In order to protect data transmission security,

 all transmit data (except device registration instructions) use dynamic encryption key Token for the 3DES symmetric encryption.

Validity of Token value is normally configured by the server. When the server receives data , it needs to confirm whether the Token value expires. If expired, then return the error. The device can re-register to get the new Token values.

### 2.3 Token Value Generation

1. Generate 8-bit random numbers
2. Key and generated random numbers

 (key in the front, the random number behind) connections in order to form new long strings

1. New long strings go on hash algorithm through SHA1.
2. Start from 16th to take 8-bit strings, this 8-bit string is as the Token value .

### 2.4 3DES Encryption and decryption algorithm

#### PHP Sample Code:

*/\*\*  
 \** ***@Created*** *by Jacobs <****jacobs@anviz.com****>  
 \** ***@Name****: encrypt  
 \** ***@param*** *$string  
 \** ***@param*** *string $key  
 \** ***@return*** *string  
 \** ***@Description****: 3DES encryption algorithm  
 \*/***function** encrypt($string, $key="") {   
 $cipher\_alg = *MCRYPT\_TRIPLEDES*;   
 $iv = mcrypt\_create\_iv(mcrypt\_get\_iv\_size($cipher\_alg,*MCRYPT\_MODE\_ECB*), *MCRYPT\_RAND*);  
  
 $encrypted\_string = mcrypt\_encrypt($cipher\_alg, $key, $string, *MCRYPT\_MODE\_ECB*, $iv);

**return** $encrypted\_string;  
  
}  
  
*/\*\*  
 \** ***@Created*** *by Jacobs <****jacobs@anviz.com****>  
 \** ***@Name****: decrypt  
 \** ***@param*** *$string  
 \** ***@param*** *string $key  
 \** ***@return*** *string  
 \** ***@Description****: 3DES decipherment algorithm  
 \*/***function** decrypt($string, $key="") {  
 $cipher\_alg = *MCRYPT\_TRIPLEDES*;   
 $iv = mcrypt\_create\_iv(mcrypt\_get\_iv\_size($cipher\_alg,*MCRYPT\_MODE\_ECB*), *MCRYPT\_RAND*);  
  
 $decrypted\_string = mcrypt\_decrypt($cipher\_alg, $key, $string, *MCRYPT\_MODE\_ECB*, $iv);  
 **return** trim($decrypted\_string);  
}

### 2.5 WSDL Address

[http://(](http://(服务器地址或域名)server address or domain name)/webserver/wsdl.html?ws=1

### 2.7 Request Interface

#### Device register to the server

**Request Way：**actionRegister

**Scene Description:** When the device re-connect the server or Token is expired, the device need request register to the server to apply for new Token value.

#### Device real time data report

**Request way：**actionReport

**Scene Description**:when the related configuration ,status and data change in the device, the device is initiative to start and report the related new data to the server.

#### Device Answering to the server command

**Request Way:** actionTransport

**Scene Description**: During the last communication with the server for the device, the server returns a device the next instruction packet, the device answering execute the results

#### Server instruction packet for the device

**Scene Description**: Each time the device and the server Requested, the server returns the device the next instruction package.

### 2.8 Request Parameter Specification

#### Device registered with the server

**Request Parameter**

1. Protocol Package

**Protocol Package content：**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Device serial No. | could be the device ONLY identification No. | 20 |
| 2 | Device Model |  | 20 |
| 3 | Device firmware version |  | 20 |
| 4 | Communication protocol version |  | 20 |

#### Device real-time data reporting

**Request Parameter:**

1. Device ONLY No.: Server generates the device only identification number when the device register.
2. Protocol Package

**Protocol Package Content:**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Device Only No. | Server generates the device only identification number when the device register. | 32 |
| 2 | Instruction No. |  | 8 |
| 3 | Command Word | see more details about command word | 4 |
| 4 | reserved word |  | 4 |
| 5 | the length of add-on package | Describe the content-length of the subsequent add-on package | 8 |
| 6 | add-on package | Submit data packet contents, as described in the interface documentation | 0~99999 |

#### Device response to server commands

**Request Parameters:**

* 1. Device ONLY No.: Server generates the device only identification number when the device registers.

1. Protocol Package

**Protocol Package Content:**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Device ONLY No. | Server generates the device unique identification number when the device register. | 32 |
| 2 | Instruction No. |  | 8 |
| 3 | Demand Word | see more details about command word | 4 |
| 4 | reserved word |  | 4 |
| 5 | the length of add-on package | Describe the content-length of the subsequent add-on package | 8 |
| 6 | Add-on Package | Submit data packet contents, as described in the interface documentation | 0~99999 |

#### Server instruction packages for the device

**Instruction Package Content:**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Device Unique No. | Server generates the device unique identification number when the device register. | 32 |
| 2 | Instruction No. |  | 8 |
| 3 | Demand Word | [details](#_第四章_命令字) for demand word | 4 |
| 4 | The next request time | Available values are: 0,5,10,60,300 seconds (ASCII strings)  “0” means that after the device execute the command, the device  immediately requests to the server once again | 4 |
| 5 | the length of add-on package | Describe the content-length of the subsequent add-on package | 8 |
| 6 | Add-on Package | Submit data packet contents, as described in the interface documentation | 0~99999 |

## Chapter 3; Interface Document

### 3.1 Device registered with the server

**Command Word：**9004

**Add-on Package：**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Device series No. | could be the device UNIQUE identification No. | 20 |
| 2 | Device Model |  | 20 |
| 3 | Device firmware version |  | 20 |
| 4 | communication protocol version |  | 20 |

**Server Response:**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | 8-bit random number | Combined with the key generates the Token value，Generation methods, please refer to2.4 | 8 |
| 2 | Instruction Packet | In this method, general instruction packet is fixed as device login instruction.  Instruction packet format as described in <server instruction packet on the device>  Login instructions package content see <login instruction> |  |

### 3.2 Device real-time reporting

#### 3.2.1 Real-time attendance records

**Command Word：**3002

**Add-on Packet：**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Employee Attendance No. | Uint64, lower 5 bits valid, big end | 5 |
| 2 | Attendance Time | The seconds from 2000-1-2 00:00:00，uint32，big end | 4 |
| 3 | Identification Type | Uint8 | 1 |
| 4 | Pass Type | Uint8 | 1 |
| 5 | Reserved Word |  | 5 |

Attention: Add-on Package length is the integral multiple of 16, each attendance record length is 16 bytes

### 3.3 Server command to the device

#### 3.3.1 Login

**Command Word：**9001

**Add-on Package：**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Device No. | When the device register, the server generates the unique number for the device  (in this document all device No. mean this No.) | 32 |

**Device Answering Command：**9001

#### 3.3.2 No task Command

**Command Word：**9002

**Add-on Package：** (blank)

**Device answering Command：**9002

#### 3.3.3 Device Re-registration

**Command Word：**9004

**Add-on Package：** (blank)

**Device answering Command：**9004

#### 3.3.4 Access Denied

**Command Word：**9003

**Add-on Package：** (blank)

**Device answering Command：**9004

#### 3.3.5 Command Error

**Command Word：**9002

**Add-on Package：** (blank)

**Device answering Command：**9004

#### 3.3.6 Get device network parameter

**Command Word：**1003

**Add-on Package：** (blank)

**Device answering Command：**1003

#### 3.3.7 Batch download employee information

**Command Word：**2001

**Add-on Package:**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | starting position | Default to start from the “0” employee | 8 |
| 2 | Get employee quantity |  | 8 |

**Device answering Command：2001**

#### 3.3.8 Download the designated employee information

**Command Word：**2002

**Add-on Package：**

|  |  |  |  |
| --- | --- | --- | --- |
| No | Parameter Name | Parameter Specification | Length |
| 1 | Employee attendance No. |  | 16 |

**Device answering Command：2002**

#### 3.3.9 Batch upload employee information

**Command Word：**2101

**Add-on Package：**

|  |  |  |  |
| --- | --- | --- | --- |
| No | Parameter Name | Parameter Specification | Length |
| 1 | Employee Attendance No. | Uint64, lower 5 bit valid，big end | 5 |
| 2 | Attendance Password | Uint32，small end | 3 |
| 3 | Card No. | Uint32，big end | 4 |
| 4 | Names | Unicode | 20 |
| 5 | Department No. | Uint8 | 1 |
| 6 | Group Code | Uint8 | 1 |
| 7 | Verification Mode | Uint8 | 1 |
| 8 | Fingerprint Identification | Uint16，small end，lower 10 bits represent finger | 2 |
| 9 | Administrator or not | Uint8 | 1 |
| 10 | Reserved |  | 2 |

Attention: Add-on Package length is the integral multiple of 40, the length of each employee information is 40 bytes, when multi-employee are uploaded in batch, multi add-on packages are overlaid.

**Device answering Command：2101**

#### 3.3.10 Upload some employee information to the device

**Command Word：**2102

**Add-on Package：**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Employee Attendance No. | Uint64, lower 5 bits valid，big end | 5 |
| 2 | Attendance Password | Uint32，small end | 3 |
| 3 | Card No. | Uint32，big end | 4 |
| 4 | Name | Unicode | 20 |
| 5 | Department No. | Uint8 | 1 |
| 6 | Group Code | Uint8 | 1 |
| 7 | Verification Mode | Uint8 | 1 |
| 8 | Fingerprint Identification | Uint16，small end，lower 10 bits represent finger | 2 |
| 9 | Administrator or not | Uint8 | 1 |
| 10 | Reserved |  | 2 |

**Device Answering Demand：**2102

#### 3.3.11 Empty all employee information in the device

**Command Word：**2021

**Add-on Package：** (Blank)

**Device answering Demand：**2021

Attention: when we empty device employee information, the fingerprint data will be empty in the device, but attendance records will be reserved.

#### 3.3.12 Delete the designated employee from the device

**Command Word：**2022

**Add-on Package：**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Employee Attendance No. |  | 8 |

**Device answering Demand：**2102

Attention: when we empty device employee information, the fingerprint data of this designated employee will be empty in the device, but attendance records will be reserved.

#### 3.3.13 Download all fingerprint information

**Command Word：**2031

**Add-on Package：** (blank)

**Device answering Demand：**2031

#### 3.3.14 Download the designated fingerprint information

**Command Word：**2032

**Add-on Package：**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Employee Attendance No. |  | 8 |
| 2 | Finger No. |  | 8 |

**Device answering Demand：**2032

#### 3.3.15 Batch upload employee fingerprint

**Command Word：**2131

**Add-on Package：**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Employee Attendance No. |  | 5 |
| 2 | Finger No. |  | 1 |
| 3 | Fingerprint template data |  | 338 |

**Device answering Demand：**2131

Attention: Add-on Package length is the integral multiple of 344, the length of each employee information is 344 bytes, when multi-employee are uploaded in batch, multi add-on packages are overlaid.

#### 3.3.16 Upload some fingerprint

**Command Word：**2132

**Add-on Package：**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Employee Attendance No. |  | 5 |
| 2 | Finger No. |  | 1 |
| 3 | Fingerprint template data |  | 338 |

**Device answering Demand：**2132

Attention: Add-on Package length is the integral multiple of 344, the length of each employee information is 344 bytes, when multi-employees are uploaded in batch, multi- add-on packages are overlaid.

#### 3.3.17 Empty all fingerprint information in the device

**Command Word：**2041

**Add-on Package：**（blank）

**Device answering Demand：**2041

#### 3.3.18 Delete the designated fingerprint from the device

**Command Word：**2042

**Add-on Package：**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | 长度 |
| 1 | Employee Attendance No. |  | 8 |
| 2 | Finger No. |  | 8 |

**Device answering Demand：**2042

Attention:If at the same time delete multi-fingerprints, multi add-on packages are overlaid.

#### 3.3.19 Download all attendance records

**Command Word：**3001

**Add-on Package:**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | record starting position | default start from “0” | 8 |
| 2 | Get the quantity |  | 8 |

**Device answering Demand：**3001

#### 3.3.20 Download the latest attendance records

**Command Word：**3002

**Add-on Package:**（none）

**Device answering Demand：**3002

### 3.4 Device Answering

#### 3.4.1 Employee information Add-on Package

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Employee Attendance No. | Uint64, lower 5 bit valid，big end | 5 |
| 2 | Attendance Password | Uint32，small end | 3 |
| 3 | Card No. | Uint32，big end | 4 |
| 4 | Name | Unicode | 20 |
| 5 | Department No. | Uint8 | 1 |
| 6 | Group code | Uint8 | 1 |
| 7 | Verification Mode | Uint8 | 1 |
| 8 | Fingerprint identification | Uint16，small end，lower 10 bits represent finger | 2 |
| 9 | Administrator or not | Uint8 | 1 |
| 10 | Reserved |  | 2 |

#### 3.4.2 Network parameter Add-on Package

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Connection internet ways | 0： wired connection  1： wireless connection  Uinit8 | 1 |
| 2 | IP Address | Uint32 | 4 |
| 3 | NET MASK | Uint32 | 4 |
| 4 | MAC | Unit64 | 6 |
| 4 | Gateway | Unit32 | 4 |
| 5 | Server Address | Uint32 | 4 |
| 6 | far-end permit | 0: Not allowed  1：allowed  Unit8 | 1 |
| 7 | port | Unit16，small end | 2 |
| 8 | working mode | 0: Server  1:Client  Unit8 | 1 |
| 9 | DHCP | 0: disable  1：enable  Unit8 | 1 |

#### 3.4.3 Employee fingerprint add-on package information

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Employee Attendance No. |  | 5 |
| 2 | Fingerprint No. |  | 1 |
| 3 | Fingerprint template data |  | 338 |

#### 3.4.4 Attendance Records Add-on Package

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Parameter Name | Parameter Specification | Length |
| 1 | Employee Attendance No. | Uint64, lower 5 bits valid，big end | 5 |
| 2 | Attendance time | The seconds from2000-1-2 00:00:00，uint32，big end | 4 |
| 3 | verification type | Uint8 | 1 |
| 4 | pass type | Uint8 | 1 |
| 5 | reserved word |  | 5 |

## Chapter 4: Command Word

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Command Word | Description | Suitable Object | |
| server command to the device | the device answering to the server |
| system related | | | | |
| 1 | 9001 | device login | Y | Y |
| 2 | 9002 | no command | Y | Y |
| 3 | 9003 | access denied | Y |  |
| 4 | 9004 | device register | Y | Y |
| 5 | 9005 | command error | Y | Y |
| device Configuration related | | | | |
| 6 | 1003 | get network configuration | Y | Y |
|  | 1103 | set network configuration | Y | Y |
|  | 1001 | get attendance information | Y | Y |
|  | 1101 | set attendance information | Y | Y |
|  | 1002 | restart | Y |  |
|  | 1004 | set time | Y | Y |
|  | 1005 | get screen protection time | Y | Y |
|  | 1105 | set screen protection time | Y | Y |
|  | 1007 | get short message | Y | Y |
|  | 1107 | set short message | Y | Y |
|  | 1008 | delete short message | Y | Y |
|  | 1009 | upgrade information return |  | Y |
|  | 1109 | push upgrading package | Y |  |
| employee related | | | | |
|  | 2001 | in the batch get the employee | Y | Y |
|  | 2101 | in the batch set the employee | Y | Y |
|  | 2002 | Get individual employee information | Y | Y |
|  | 2102 | Set individual employee information | Y | Y |
|  | 2021 | Delete all employees | Y | Y |
|  | 2022 | Delete designated employee | Y | Y |
|  | 2031 | get in the batch employee fingerprints | Y | Y |
|  | 2131 | Set in the batch employee fingerprints | Y | Y |
|  | 2032 | Get individual employee fingerprint | Y | Y |
|  | 2132 | Set individual employee fingerprint | Y | Y |
|  | 2041 | Delete all fingerprints | Y | Y |
|  | 2042 | Delete single fingerprint | Y | Y |
| Attendance records related | | | | |
|  | 3001 | Get all attendance records | Y | Y |
|  | 3002 | Get the latest attendance records | Y | Y |
|  | 3021 | Empty all attendance records | Y | Y |
|  | 3022 | Empty expired records | Y | Y |