CamaC is a Web Service for viewing pictures from an IP Camera CCTV system.

CamaC
User Manual

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Contents

1   Overview

CamaC is a Web Service for viewing pictures from a CCTV system.

It provides **Alert Notification** and access to historical **Trigger Events** using nothing more than an Internet connection and a **Web Browser**.

It has been designed with the primary goals of alerting the user to new events and for ease of access to image history. It can be left running all day in a spare browser tab or in a separate Chrome 'application mode' instance.

An alert noise is sounded when the camera is triggered allowing you to review the cause.

Try the demo at https://app.comsci.co.uk/camac

1.1   Features:

➢   No software to install. Just use a standard web browser. No plugins required.

➢   Accessible from any Internet connected location. Desktop, Tablet and smart phone compatible.

➢   Simple interface designed for ease of use.

➢   Simplifies camera setup. No static IP address or dynamic DNS requirements.

➢   Secure as there is no need to open router ports to allow access from the outside world.

➢   https encrypted connection, support for FTPS (Transport Layer Security), salted and hashed passwords ensures that your data is safe.

➢   Multiple users can access the same set of images independently.

➢   Provides remote storage for your images in case of equipment theft or damage.

➢   Basic service subscription cheaper than the cost of the electricity to run a hardware recorder 24hours a day, let alone depreciation and maintenance costs.

1.2   Typical Usage

➢ Security applications to monitor access.

➢ Remote monitoring of children, pets or elderly relatives.

➢ Homeworkers to monitor access door. No more missed deliveries or unnecessary interruptions from cold callers!

➢ Equipment monitoring.

➢ Sharing images with friends, colleagues, customers.

1.3   Requirements

Digital CCTV system capable of transferring images over the Internet via FTP. (Covers most IP cameras and digital CCTV systems produced in the last 8 years)

2   Account Setup

Create an account from by clicking on the 'Create Account' button on the homepage

https://app.comsci.co.uk/camac

Choose a user name and enter your email address. Your account details will be emailed to you when the account has been setup.

The email will contain your username and password for the **App Login account** and the **camera FTP account**. The login account details are used to access the web browser application. The FTP account details are required by your CCTV system to send pictures to the server.

2.1   Camera Configuration Options

Optimal Configuration

CamaC works best with a camera that can be triggered by an event such as Motion Detection, a Pressure Pad, PIR Sensor, Door bell press etc. The relevant pictures / video clip can then be sent to the server for storage and alert generation. Illustration 1 shows the typical output from an event consisting of a group of 11 pictures. The camera was set to record pictures every second for 8 seconds following a motion detection event. The camera also records 3 frames before the trigger event. (In reality, you might want to record for longer at a faster rate but the concepts are the same). So that CamaC displays the best image when Key Frame mode is selected, set a Group key frame index of 4 for this camera.
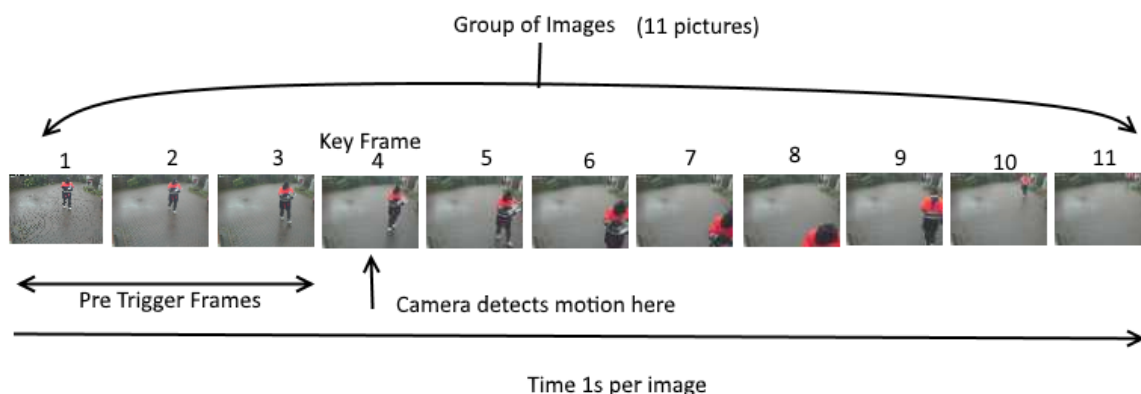

Illustration 1

If your camera supports video recording of events, you can FTP video clips to the CamaC server. (Currently only MP4, AVI and MKV video formats are supported). CamaC will decode the video into 1 second frames for the browser display. You can use the same Group Key Frame Index setting to generate a key frame that is this many seconds from the start of the video.

CamaC also supports the concept of Snapshot images. These are pictures that are sent on a scheduled timer, for example, once every ten minutes. These will be shown in the browser to give confidence that the system is all working, camera powered and connected to the Internet, the CamaC server is running and connected to your browser. If these snapshot images are given a name that starts with the text 'snapshot' then alert generation is disabled for these pictures and only the 100 most recent snapshots images are stored against your disk quota.

Record Everything Configuration (Sub-optimal)

CamaC can also work with a camera that is simply scheduled to send an image or video clip on a timer. However, this will consume a lot more Internet bandwidth and require more disk storage to provide the required historical view. Also, there will be many images to search through to find any interesting events. You will probably also want to go into the CamaC Camera settings to disable the alert notifications as these will soon get annoying!

2.2   Setting up Your Camera

This will obviously vary according to the camera manufacturer and model. Most typically have a web interface that allows you to configure the settings with a Web Browser. Refer to your camera's user manual for specific details.

Quick Start Guide:

1. Connect your camera to your private network and power up.

2. Determine the IP address that has been assigned to your camera

3. Use your browser to connect to your camera (e.g. http://192.168.1.101)

4. Navigate to the camera settings page and configure the FTP settings to connect to the CamaC FTP server

The FTP parameters should be set as

> **User** : *As detailed in account creation email message*
> **Password**: *As detailed in account creation email message*
> **Host**: app.comsci.co.uk
> **Port**: 21
> **Mode**: Passive (TLS encryption is best)

In more detail:

Find a suitable spot location for installing your camera. Motion detection will work best if the background is normally static: no moving leaves / branches traffic, no varying light conditions. Connect your camera to your local network, wired or wireless.

Most cameras are configured from a web page generated by the camera. To access this you need to find your camera's assigned IP address. Consult your camera manual on how to do this. Typically, the camera will come with a utility to scan the network to find your camera. If not, you may need to examine your broadband routers IP4 address table to find what address has been given to your camera. If you are still stuck, you can try some third part utilities that will scan your local network for suitable IP camera candidates e.g. http://arllc.net/findipcam/ or http://angryip.org/about/ or the Android Fing app from the Google play store

Now use your Internet browser to connect to your IP Camera by typing the local IP address directly into the website field. e.g. if your camera's IP address was 10.0.1.10, browse to the website **http://10.0.1.10/**

Your browser should now display a camera welcome page. The screens and options will vary between different camera makes and models but the concepts should be relatively similar.

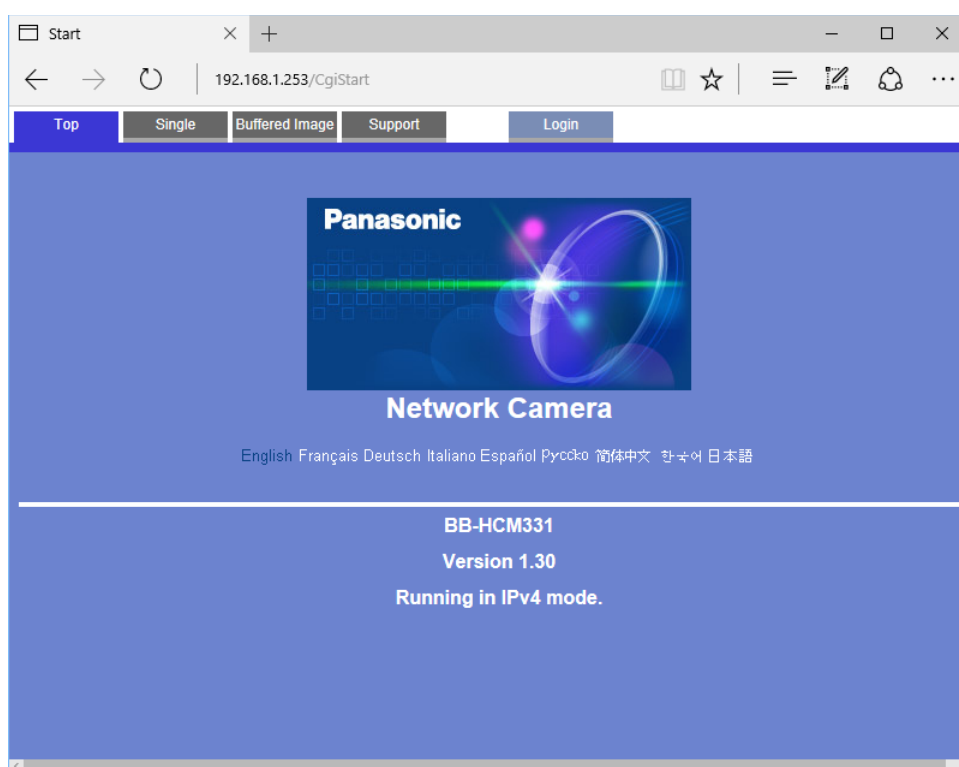E.g. for a Panasonic IP Camera at 192.168.1.253 see Illustration 2

Illustration 2

After logging in to the camera as an administrator, we can navigate to the settings pages. Here's the page for setting an FTP trigger for a Panasonic camera:
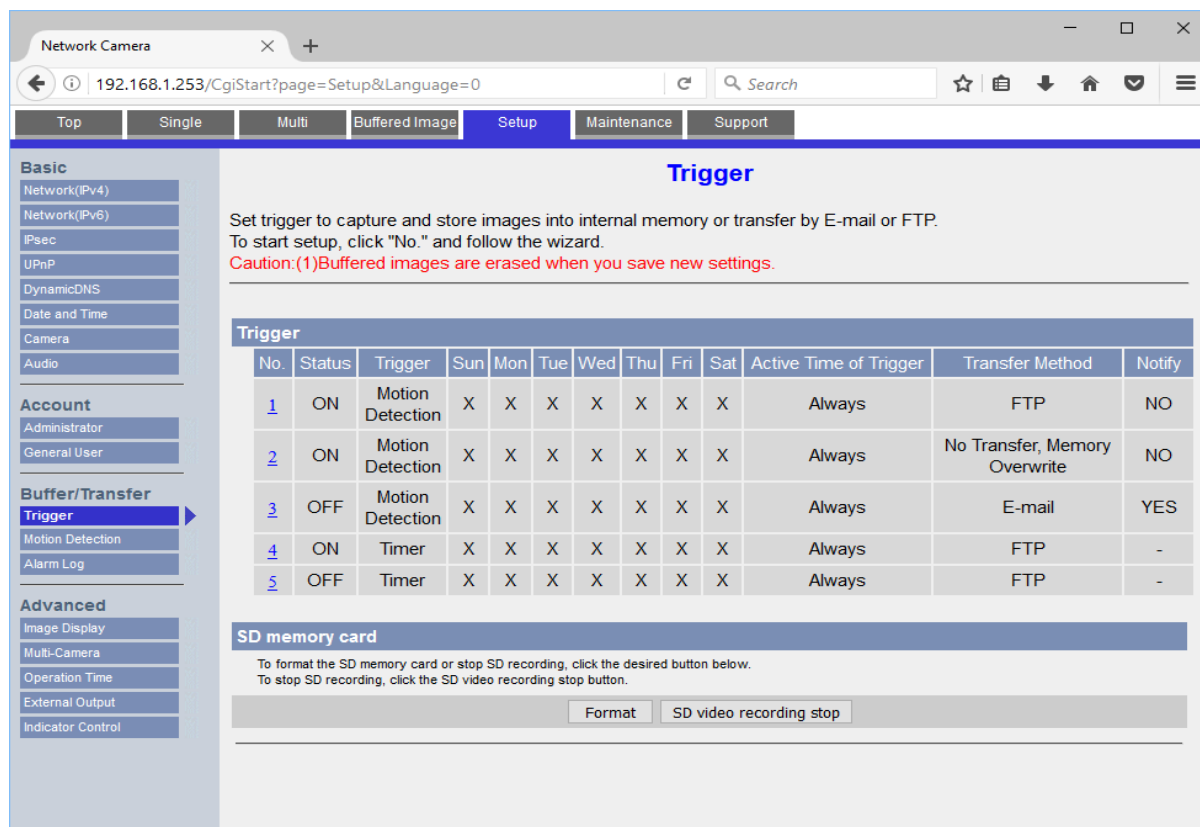

Illustration 3

Triggers 1 and 4 have been defined as FTP enabled

In this case Trigger 1 defines what is transferred to CamaC on a motion detected event.

This Panasonic screen allows us to specify 4 frames sent before any triggered event and 40 frames after the event:
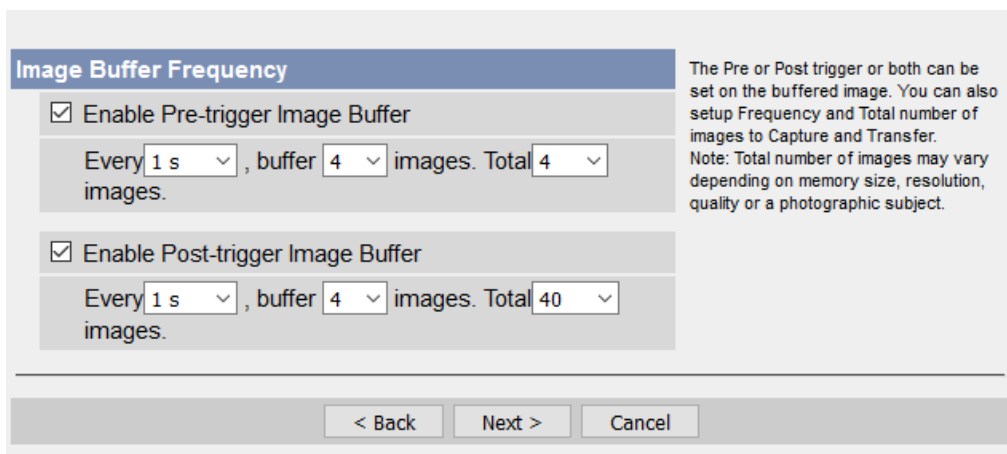

Illustration 4

Trigger 4 is simply a scheduled event that transfers a single snapshot image every ten minutes. Trigger 2 is used internally by the camera to record to an SD card.

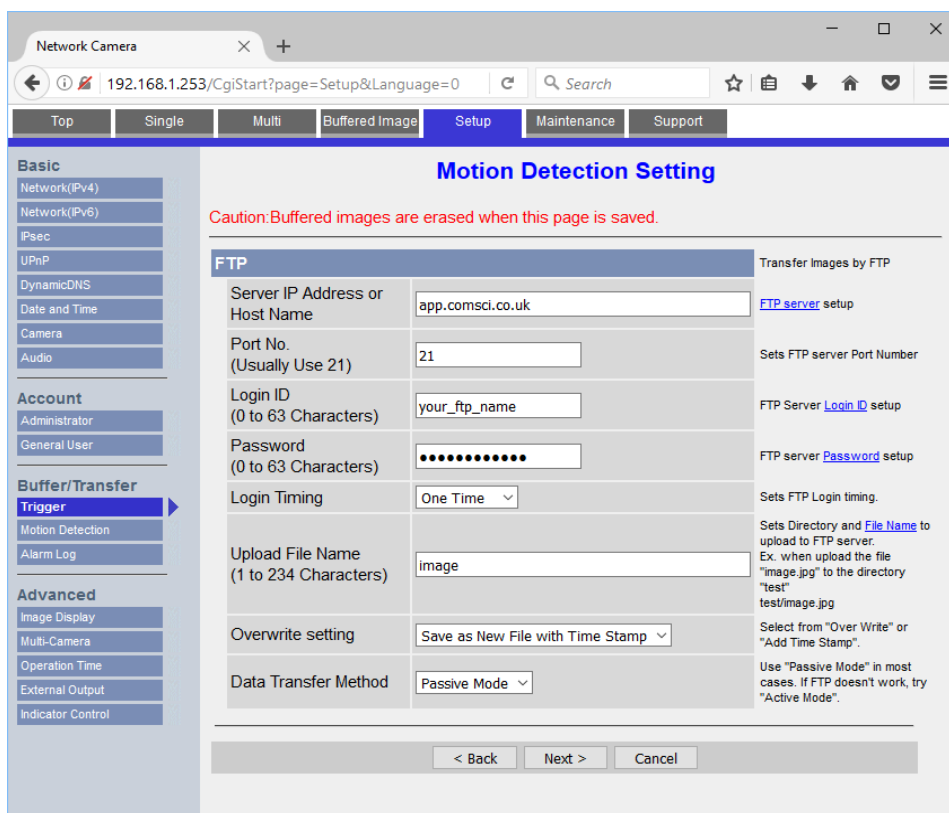The FTP server settings for trigger 1 are set on this page:

Illustration 5

The **server IP address** is app.comsci.co.uk Depending on your camera model, you may need to specify this as ftp://app.comsci.co.uk Even better, if your camera supports encrypted FTP (FTPS via TLS or SSL) then maybe enter as ftps://app.comsci.co.uk

The **port** should be left as the default value 21 or alternatively 990 for FTPS.

The **login ID** and default **password** will be the values emailed to you in your account creation message. The FTP password for each camera can be changed in the CamaC App from the camera settings page. (Note this is separate from the App Login password even though initially set to the same thing)

For the Panasonic camera, FTP Login timing can be One time or every time. Here One time is selected for efficiency as this will login once for the group of images rather than for every image. Upload filename can be anything but if it starts with 'snapshot' CamaC will treat these images differently (See Snapshot Mode). The files should be saved to a unique name. On the Panasonic, this is done by selecting 'Save as New File with Time Stamp' as the Overwrite setting.

Select **Passive Mode** or PASV as the data transfer mode. This is preferred over Active Mode or ACTV otherwise you may need to open or forward ports in your router or firewall.

If your camera supports the uploading of a test image, then try it now to test that the entered settings are compatible. If you are logged into your CamaC account in a separate window, you should get an alert as soon as the file transfer is started and the image will be displayed when the picture is transferred.

2.3   Changing Quotas and Adding Cameras

Login to your CamaC account and navigate to **Settings → Account → Regrade Account**…

From here you can change the number of cameras, and the total Storage and Transfer Quotas for your account.

The N**umber of Cameras** defines the number of separate cameras associated with your account. Each camera has a separate FTP user name and can have a separate password. The first camera has an FTP ID/User name that is the same as your CamaC account login ID. Subsequent cameras have the FTP ID yourusername_c2, yourusername_c3, … yourusername_cn where n is the total number of cameras. Each time you add a camera, the settings, including the FTP password, will be cloned from the last camera in your account. These can then be changed independently if required. If you reduce the number of cameras all data from the excess cameras will be deleted.

The **Transfer Quota** is a limit on the amount of data transferred from your cameras to the server within each 30 day period. If you exceed this limit, FTP will be disabled so that no new pictures can be uploaded to the server for the remainder of the 30 day period. If it looks like your limit will be breached before the 30 days have passed, CamaC will automatically send warning emails to your registered email address.

The **Storage Quota** is the total amount of disk space reserved for all images transferred from all cameras in your account. When the limit is reached, the oldest images will be automatically deleted to maintain your storage quota on the limit. Snapshot images are considered first, to maintain the most recent 100, then the oldest image groups are considered for deletion until your account is back within the quota. Hence, the storage quota will have a direct relationship with the amount of historical data that is available to browse.

The Regrade Account page also gives some crude estimates on how the selected settings translate to camera events and back history. These estimates assume that the pictures are the given size and that 100% of the transfer allowance is used. If you only use half of your transfer allowance then your back history will be double the estimate shown. The estimates are for information only. The account is managed from just the Transfer Quota and Storage Quota values.

3   CamaC App Browser View

3.1   General Operation

Having logged in to your account you will be presented with a view similar to that below:
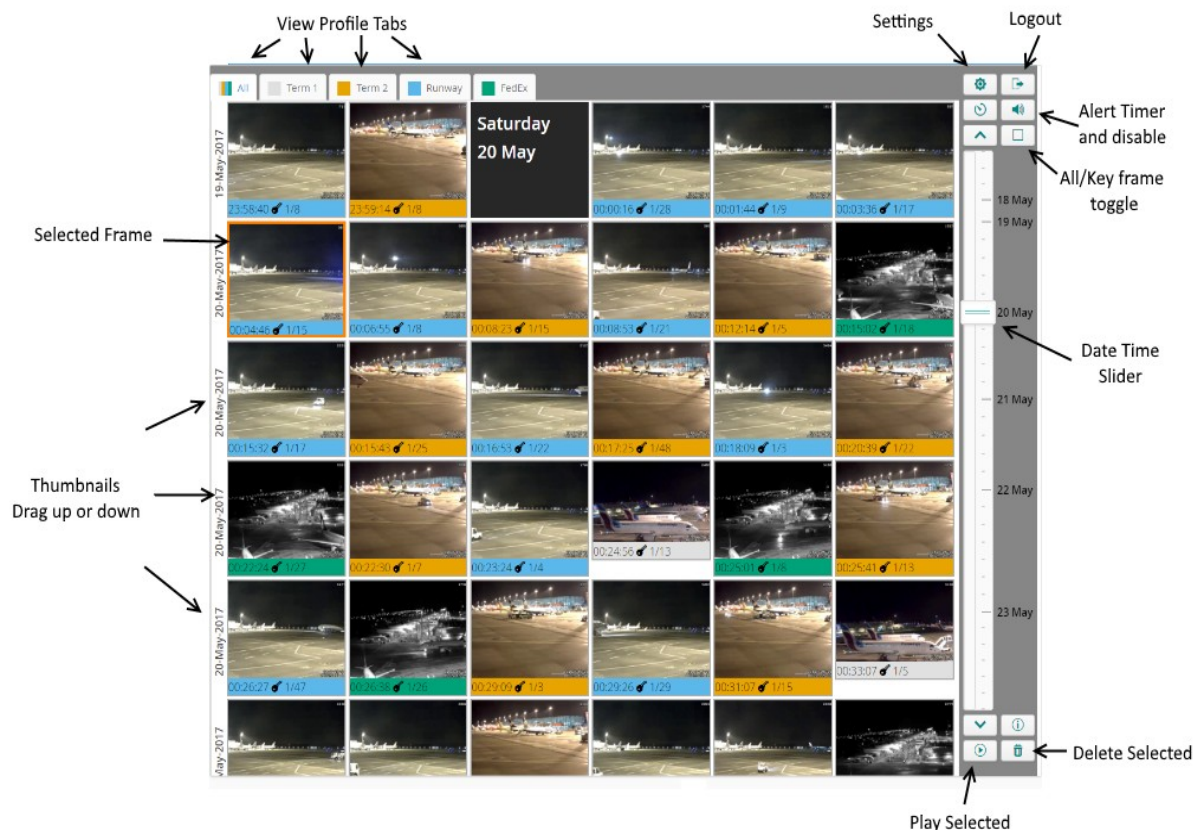

Illustration 6

The display consists of a top row of view profile tabs, a thumbnail area and some navigation controls.

By default, the thumbnail area shows the most recent key images. The screen can be dragged down (left mouse or touchscreen dragging) to display historical images. Images can also be browsed by using the date / time slider and back page / forward page buttons. The date / time slider also accepts cursor key and page up / page down keyboard input. Double clicking an image will open the selected thumbnail in the event viewer player window.

View profiles: Cameras, number of columns and the display of all frames or just key frames can be editted to your preferences from the settings screens. The profiles are stored per browser device and can also be stored as the default settings for all new browsers.

The backward and forward frame controls will navigate forwards or backwards by a full screen of thumbnails. Navigating to a particular date and time can be achieved using the slider control.

An alert (dog barking) is sounded when a new picture arrives. This also triggers the snooze countdown timer that mutes the app for a further 2 minutes to avoid annoying repeat alerts. Clicking on the snooze button allows the system to be muted for an increasing amount of time. The mute toggle button allows alert sounds to be switched off. The new picture alert notification can also be completely disabled from each camera's settings page.

The pictures are aligned in rows with the date in the left hand margin. Each picture is also annotated with the time and group info as shown below:
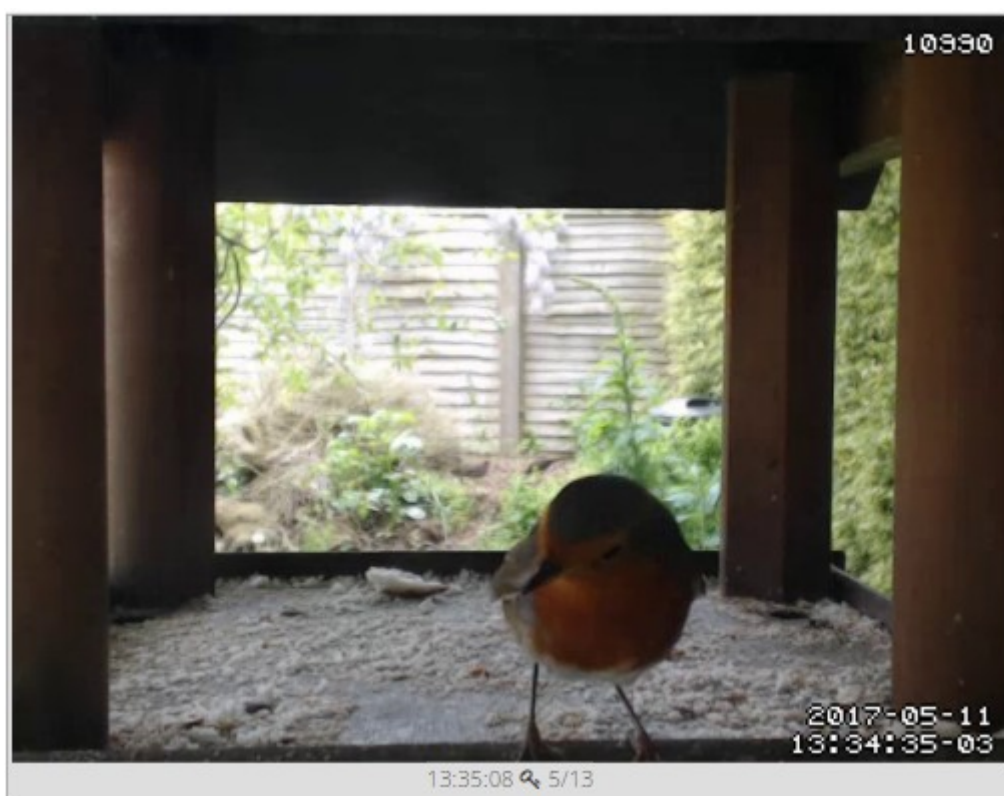

Illustration 7

It shows the time that the picture was received by the CamaC server. Configure the appropriate camera time zone from the settings page. The **key symbol**   shows that this is a key frame and the numbers show that this is the fifth frame in a group of 13 frames. For non key, ordinaryframes the icon displayed is   For snapshot images the icon displayed is

Double clicking a picture or pressing the player control will activate the Event Viewer player. This allows the individual pictures of an event to be examined in detail. Use the play, pause, back, step and slider controls to view the pictures as desired. The Play control allows an MP4 video of the group to be played / downloaded in the browser. If the camera is configured to send a video clips to CamaC, then the Group Video Player will attempt to play this video. Whether this succeeds depends on the type of video uploaded and the browser used. If the camera is configured to send individual pictures to CamaC, then CamaC will stitch these together to make an MP4 video for playback. The smoothness of this video will obviously depend on how frequently the images were uploaded.

The **Delete Button** allows the selected picture (all frames in view) or all pictures in the selected group to be deleted (key frame view). Note this is not really necessary as CamaC will automatically delete old images automatically to maintain your storage quota. However, it can be used to prematurely delete unwanted pictures and restore space in your quota.

The Mute Toggle Button Enables / Disables the alert sounds. On enabling, an alert sound is generated to allow you to set an appropriate volume level.

The Snooze button. Disables alerts for a timed duration. Each press increases the duration of the snooze. Use the mute toggle button to instantly re-enable the alerts.

4   Settings

4.1   Settings -> Account

Displays your user account details.

The Transfer Quota is the amount of upload data allowed per 30 day period. CamaC is not really designed as a 24 x 7 recorder replacement. It is more suited to the recording and viewing of triggered events e.g. Motion Detection. The transfer quota automatically resets to the full allowance every 30 days.

The transfer usage shows how much data has been uploaded in this period and gives an estimate for the 30 day total.

The disk quota determines how space is allocated for storing pictures and hence how much historical data is available for review. This quota is a 'rolling' total. This means that when the limit is reached, old pictures are automatically deleted to make way for new pictures.

The email address is the address registered to the account and will be used to send status and reset messages. There are also controls for changing your Login password, regrading the account limits and to permanently delete the account.

4.2   Settings -> Cam Config

This page lists your defined cameras and provides a control to enter each camera settings page.

4.3   Settings -> Cam Config → Camera Settings

The **Camera Name** can be changed to a user friendly name e.g. Front Door

The **FTP password** can be changed here. Initially, the FTP password is the same as the account password. Any new cameras added to the account will have the same password as the previous last camera. The control can be used to set unique passwords for every camera if required.

Camera Time Zone: The FTP server uses Coordinated Universal Time (UTC) internally. Setting the correct camera time zone will allow the correct local time to be displayed with each image.

The **New Group Inactivity Time** defines the duration (in seconds) of the interval between two pictures for the pictures to be considered as separate events and hence be stored in separate groups with separate key frames.

The **Group Key Frame Index** defines the index of the picture in a group that is considered to be the key frame within a group. For example, for a group of pictures triggered by a motion detection event, a few pictures may be recorded in the seconds leading up to the event. The key frame index can be used to identify the frame in which the motion was detected.

Enable Audible Alerts check box can be used to enable/disable the new event sound notifications.

Enable email alerts check box can be used to enable/disable the emailing of new event notifications. These are sent to the defined **Alert Email address.** The **Daily Limit** sets a cap on the number of alert emails that can be sent per day. The **Retrigger Delay** specifies the number of minutes that must have elapsed before a new email alert is sent. (Prevents multiple emails for the same event)

5   Advanced Features

5.1   Snapshot Mode

Many IP cameras support the upload of images on a scheduled timer in addition to motion detection. The snapshot feature allows recent images to be displayed based on a timer, say every ten minutes. This gives you confidence that the connection is still active and camera is still working. CamaC supports this mode with the concept of a snapshot image. An image file that has a name that starts with "snapshot" (all lowercase) is considered as a snapshot image. Such images do not cause a notification alarm. Up to 100 snapshot images are stored, then these are deleted by the rolling recorder in preference to stored event images.

5.2   Upload and play of AVI Movie files (Experimental).

Currently in development

Instead of uploading still images, some IP cameras support the transfer of video files on trigger events. These can be uploaded to CamaC and will be converted to images for review.

6   Technical Notes

6.1   Security and Encryption

CamaC takes the security and protection of sensitive data very seriously. We will not use your email address or data for any other purposes than informing you about CamaC features and your account status. All passwords are encrypted and stored as salted hashed checksums. This means that we cannot retrieve your password should you forget it but it can be reset and a new password emailed to you. Since the email is sent in plain text format, you are advised to change your passwords to values of your own choice as soon as possible.

The CamaC Browser uses a secure https connection so all details and images are sent over an encrypted link. The FTP server supports FTPS-TLS (Transport Layer Security) so in this mode all passwords and images are also secure and encrypted. However, not all IP cameras support FTPS. To support older cameras, CamaC also supports plain FTP mode. In plain FTP mode passwords are sent in plain text and images in their native format. This is equivalent to sending a postcard through the post. Your data will be available for someone in the loop to see but chances are they will not have the access or be interested anyway. **However, if you are stuck with an old IP camera without FTPS support, you are adivised not to use a password that you share with other accounts.**

6.2   Be wary about using your camera's remote access features

Many new cameras provide a web interface that can be accessed remotely over the Internet. However, these require you to open up ports in your router or enable plug and play features. Be very careful unless you know what you are doing and you trust your router and camera firmware to have plugged all potential security holes.

A broadband modem / router serves as a barrier that prevents external hackers on the Internet accessing your private local network. Provided that you do not inadvertently download or access any online malware or trojans that open up access to the outside world, you stay in control of the Internet traffic.

Several security holes that have been exposed in recent months highlight how vulnerable we are:

This link shows how canon printers could be hacked remotely if visible to the outside internet:

https://www.contextis.com//resources/blog/hacking-canon-pixma-printers-doomed-encryption/

Although in this case, the researcher just changed the printer firmware to run a video game. But what if someone less scrupulous installed a program to sniff sensitive account details, steal passwords or provide direct access to your network...

ShellShock is the name given to the recently discovered security flaw that has existed for 25 years in Unix systems that run the BASH command line interpreter. This includes many Servers, Macs and embedded devices such as Routers, NAS appliances, DVRs etc.

Most embedded devices, including IP Cameras, run a version of Unix. The version of Unix is typically frozen at production time and very few devices have the ability to update the firmware with the latest security patches as these become available to patch discovered flaws.

In summary, the only 100% secure way to avoid vulnerabilities is to never switch your computer on! However, this would miss out on the whole point of owning a computer. At least by using the CamaC web service, you expose yourself to no more risk than normal internet browsing.

6.3   Data Bandwidth Usage

CamaC tries very hard to be economical with the amount of data transferred when browsing your pictures. Images are cached in the browser history so will not need to be re-transmitted when viewed again. This makes CamaC usable in low connection speed situations where other remote access systems would suffer (E.g. slow mobile or unreliable wireless connections). However, this does mean that the video playback might seem a bit clunky compared to full data rate access direct to the camera. Also, note that if you leave your browser open and connected to your camera, data will be transferred each time a new event occurs. This could affect you if you are with an Internet Service Provider with a data cap or incurring roaming data charges.

6.4 Credits

A number of 'best of breed' software frameworks have been used to create this application. These include:

The excellent Vaadin framework for creating Rich Internet Applications.

Apache Shiro is used to provide encryption and login authorisation.

Apache FTP for the embedded FTP server.

Persistence and record keeping is provided using Mongo and Morphia.

Message passing is performed using the high performance ZeroMQ library.

7   Troubleshooting Guide

What to do if you've created an account but can't see any pictures from your camera.

Is the CamaC Server running? This can easily be checked from the Simulated Demo from the login page. This demo FTP's pictures every three minutes to the main server.
If there are recent pictures visible then the CamaC Server is running.

Can you login to CamaC? Enter your username and password and press login.
Do you see the "No Pictures" present message? If so your account works but no pictures have been transferred.

Are the FTP login details configured in your camera correct? The FTP server is more strict than the user login screen. For the FTP server you must use your login name (not your email address) and all lowercase letters as shown on the account settings tab. By default, the FTP password is the same as your account login password. This can be changed from the CamaC camera settings page.

The FTP communication can be tested independently of the camera using an FTP client on a computer. For Windows, you can install a graphical client such as 'FileZilla'. Using your FTP login credentials, you can use FileZilla to transfer any image files from your computer to CamaC and they should be displayed in your account.

A simple connectivity test can also be done from the Windows command line and does not need any software installation:-

Open a windows command console by pressing Windows Start, search for 'cmd' then run cmd.exe. A console window should open where you can type the following commands:

Type	Windows Responds
ftp<enter>	ftp>
open app.comsci.co.uk<enter>	Connected to comsci.dtdns.net. 220 Service ready for new user. User (comsci.dtdns.net:(none)):
Your_user_name<enter>	331 User name okay, need password for your_user_name. Password:
Your_password<enter>	230 User logged in, proceed
bin<enter>	200 Command TYPE okay.
put "c:\users\public\pictures\sample pictures\tulips.jpg"<enter>	200 Command PORT okay. 150 File status okay; about to open data connection. 226 Transfer complete. ftp: 620888 bytes sent in 0.5s 1110.71Kbytes/sec. ftp>

| bye<enter> | 221 Goodbye. |

If the open command fails, then it appears you have internet connectivity problems. Can you browse the rest of the internet?

If the password command fails, then either your username or password is wrong. If you can login to your CamaC web account, then change your FTP password to something known.

If you can connect and transfer the file (You may need to choose a different picture file if you do not have the Sample Picture tulips.jpg installed). If the file is transferred and displayed in CamaC then double check your camera user guide and settings for compatibility.

Why does multi-camera not work for me?

You can use the Regrade account settings screen to add further cameras to your account. So that CamaC recognises these as separate cameras, each camera is given a unique FTP username. The first camera has the same username as your account. Each additional camera wil have '_cN' appended to this username. Eg for account fred, with 4 cameras the FTP usernames would be:

fred
fred_c2
fred_c3
fred_c4

Use the appropriate FTP username when configuring the FTP server for each camera.

By default, each additional camera will have the same FTP password as the previous camera. However, these can be changed from the camera configuration settings page.