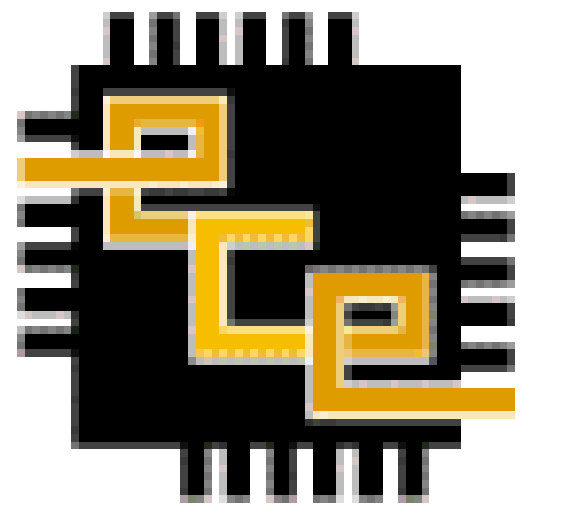


# Development of a Web Application for Continuous Analysis of Many Cameras (CAM<sup>2</sup>)

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## INTRODUCTION

There are tens of thousands of web cameras around the world that are publicly available on the Internet. The images captured by these cameras contain visual data that can be extracted by researchers using image analysis programs.

Continuous Analysis of Many Cameras (CAM<sup>2</sup>) is a cloud-based framework that allows researchers to collect data using image analysis from many cameras.

## THE SYSTEM

- Repository of 70,000+ cameras located worldwide
- Custom application programming interface (API) that enables integration of external image analysis programs
- Back-end resource management system that utilizes Amazon cloud storage
- An interactive front-end web application

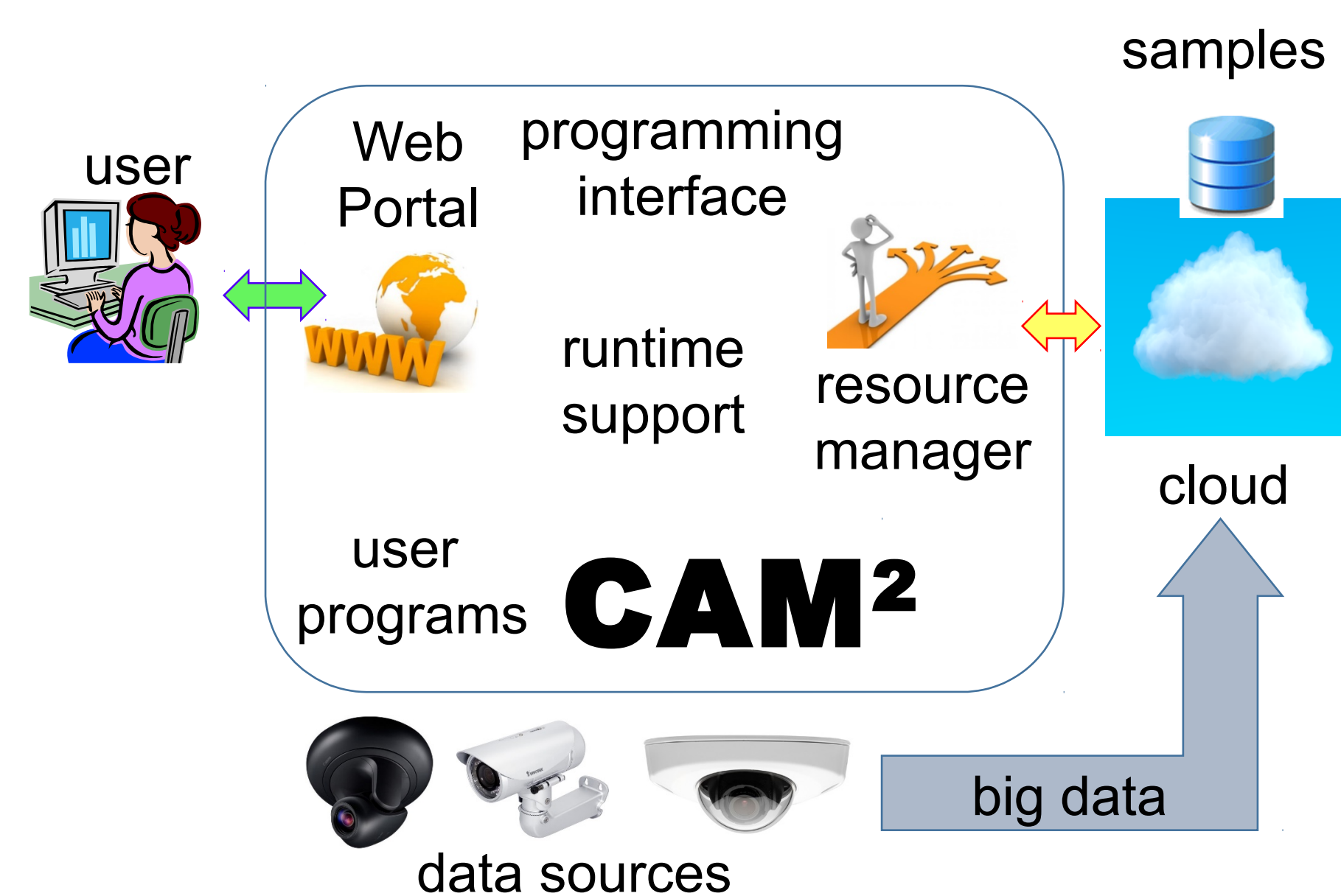


Figure 1: An overview of the CAM<sup>2</sup> system architecture

## THE WEBSITE

<http://cam2.ecn.purdue.edu>

To use the CAM<sup>2</sup> system, users create submissions on the website. A submission is a combination of a camera configuration and image analysis module.

**Configurations:** Select cameras using an interactive Google Maps widget or by browsing the latest snapshots from the cameras

**Modules:** user can upload their own image analysis modules integrated with the CAM<sup>2</sup> API or choose from a set of stock modules.

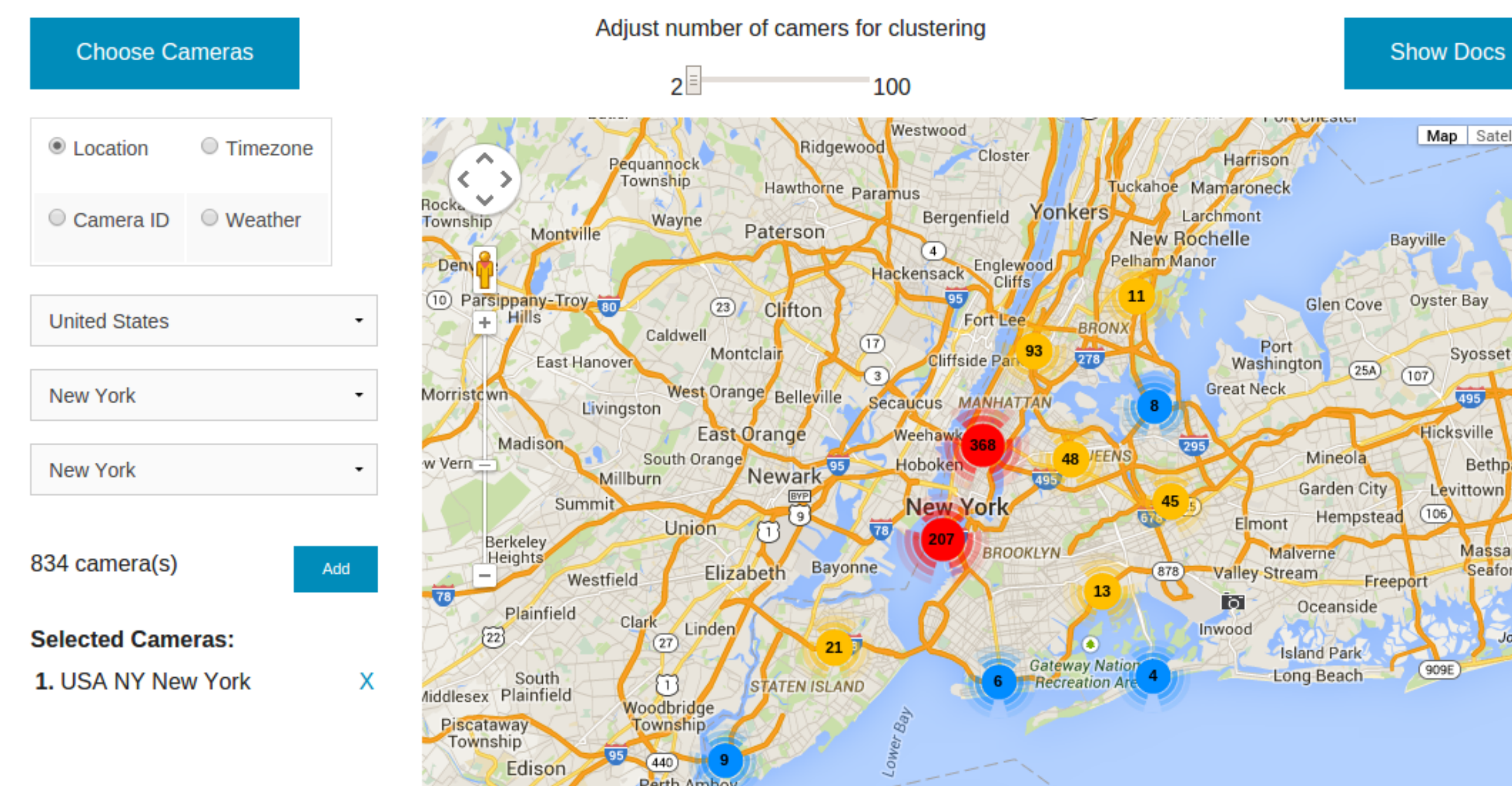


Figure 2: The CAM<sup>2</sup> website integrates a Google Maps widget that allows users to select cameras and filter by location, timezone and weather

## ALPHA 1.4 RELEASE

Introduces new features, fixes bugs and streamlines website to improve stability, functionality and user experience.

### Reorganized Submission Process:

- User is walked through the submission process step by step.
- Submissions can also be created quickly on the Quick Submit page.

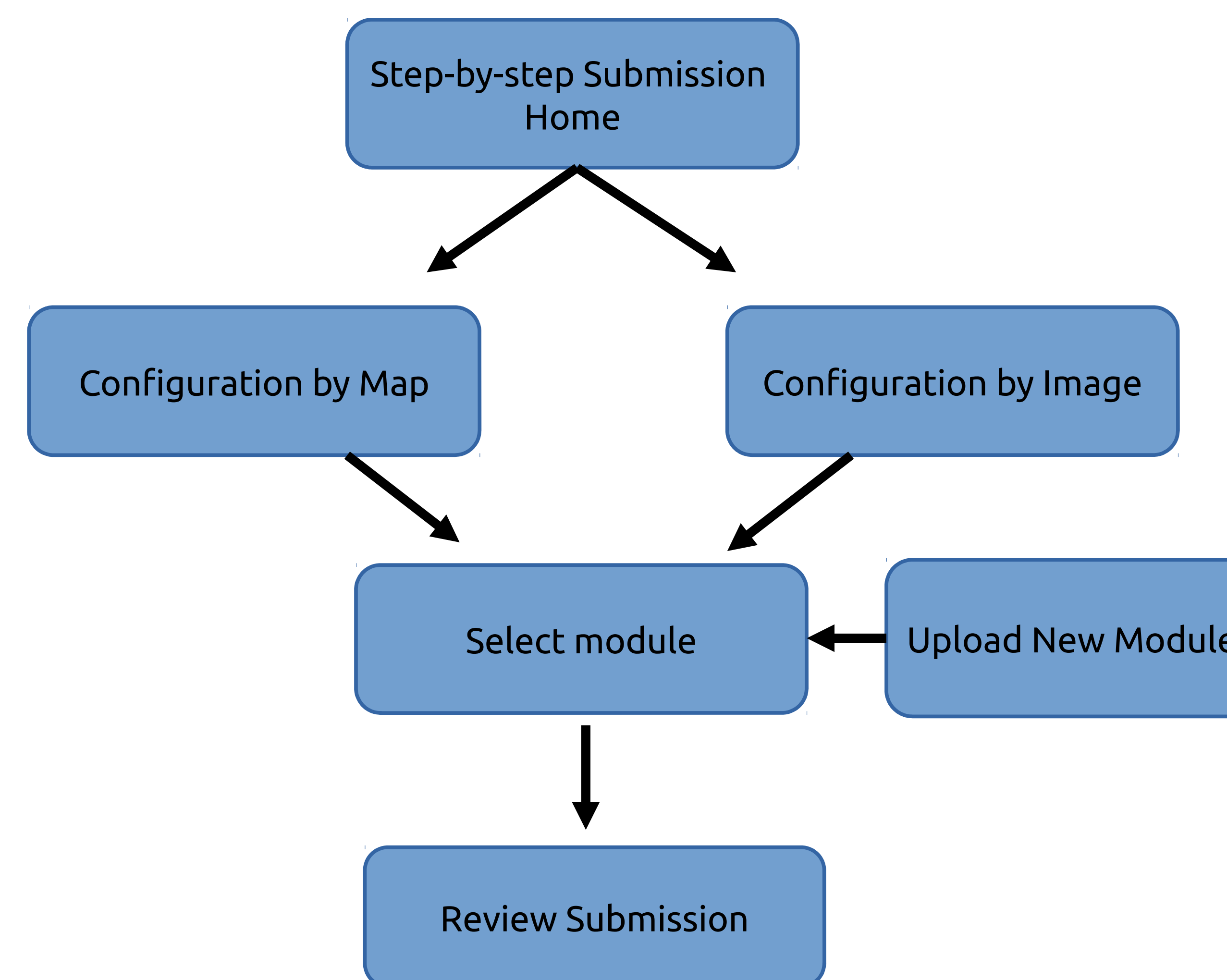


Figure 3: Flowchart of the new step-by-step submission process on the CAM<sup>2</sup> website. Each block represents a separate web page, and the arrows are automatic redirects.

## Add New Cameras

- User can now add cameras to the CAM<sup>2</sup> database
- Provide link and approximate location to add camera pending moderator approval

## Bug Fixes and Additions

- Configurations now limited to 100 cameras each.
- Weather codes replaced with descriptions in Configuration by Map
- Various bugs in configuration creation fixed
- Revised sidebar to accommodate new submission process
- Updated SSL certificate

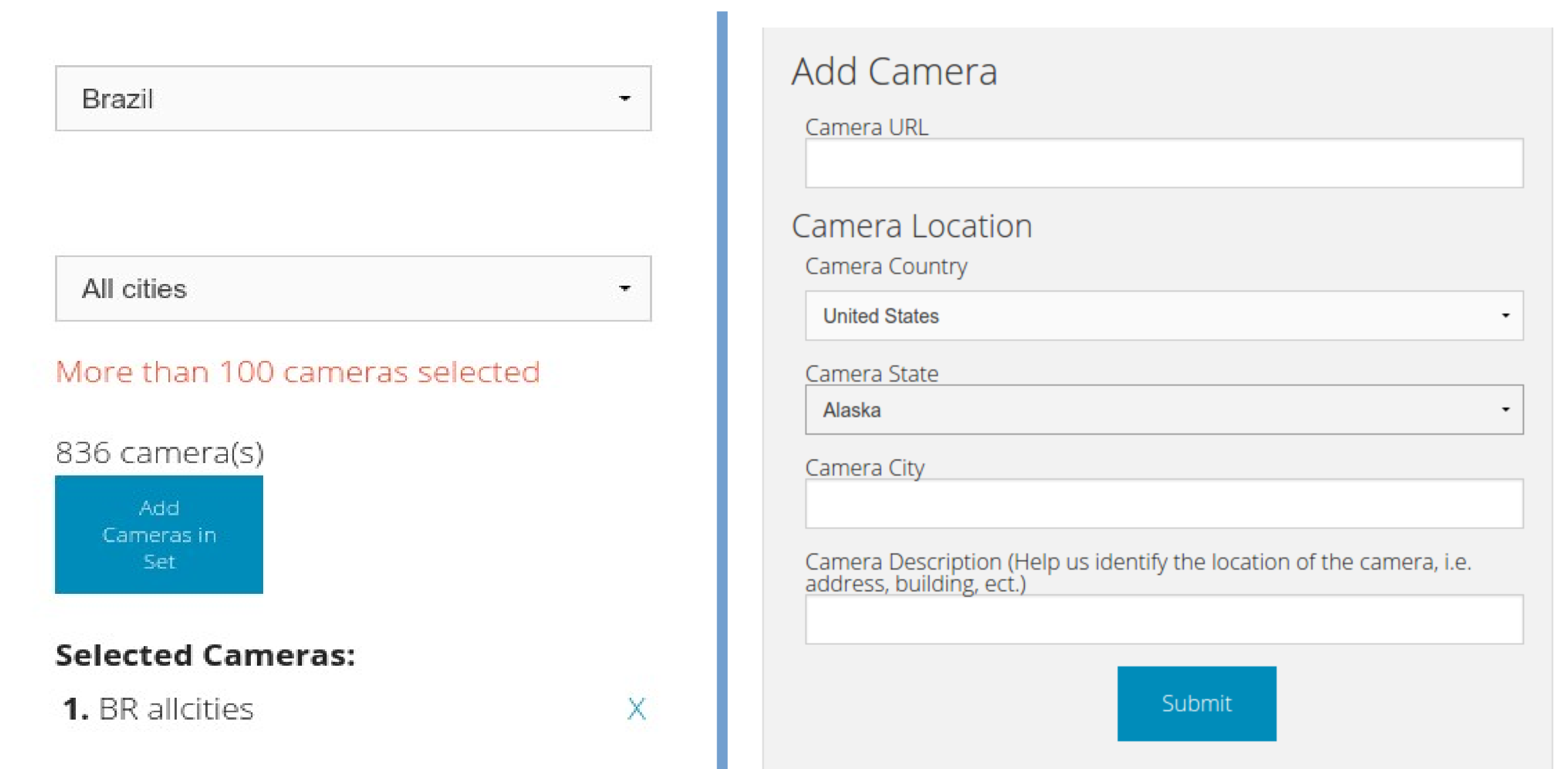


Figure 4: A look at some of the new features of the CAM<sup>2</sup> website. [Left] Configurations are limited to 100 cameras [Right] Users can now add cameras to the database

## FUTURE PLANS

- Expand camera repository to over 100,000 cameras
- Support archive video and image data
- Automated system testing
- Scale up to hundreds of back-end machines to facilitate large-scale image analysis

## REFERENCES

Ahmed S. Kaseb, Everett Berry, Erik Rozolis, Kyle McNulty, Seth Bontrager, Youngsol Koh, Yung-Hsiang Lu, Edward J. Delp, "An interactive web-based system for large-scale analysis of distributed cameras", Imaging and Multimedia Analytics in a Web and Mobile World 2015.

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