

The Stratocaching project - live network video streaming from the stratosphere.

Axis camera at 30 kilometers above the Earth.

**Organization:**

Žádná věda o.s. / Idnes.cz

Location:

Czech Republic

Application:

Live video streaming

Axis partner:

NetRex s.r.o.

Mission

Czech civil association, Žádná věda, realized the Stratocaching popular science experiment in fall 2013 in cooperation with the Idnes.cz server. The project rested in launching a weather balloon with a special basket, from which 12 flying capsules should have been released in the stratosphere. Such capsules imitating the design of a maple samara were equipped with GPS trackers and upon landing, they became the subject of a geo-location game whose purpose was to find them. The project included provision of live streaming from the balloon available at the Idnes.cz server. The camera system, including the antenna, had to fulfill high demands: The weight of the whole configuration could not exceed 600 grams and, at the same time, was supposed to be functional even under extreme freezing conditions and at the distance of tens of kilometers.

Solution

Despite the initial doubts regarding digital video streaming, the realization team, in cooperation with NetRex, decided to use an AXIS P1214-E Network Camera,

together with a radio modem and a special multi-polarization antenna. This camera model was selected for its minimal weight; however, for its use under extreme freezing conditions in the stratosphere, it was necessary to provide additional heating for the camera's optical components. A signal from the basket was received by a ground station equipped with a parabolic antenna, and video was then provided to the Idnes.cz server via the NetRex streaming platform.

Result

The video streaming configuration placed in the balloon's basket weighed a mere 586 g. However, it was able to provide fascinating live streaming HD video almost for the whole duration of the flight. At the end, the camera feed was watched by more than 220,000 viewers online, on the Idnes.cz server. Thousands of others watched the video recording from the camera's memory card.

“We are proud that as the first in the Czech Republic, we managed to realize live video streaming from the stratosphere and to introduce the beauty of the Earth and modern technologies to the public.”

Petr Bakoš, the project's Chief Designer and a member of the organizing association Žádná věda.

Jan Kužník, the Editor in Chief of the Technet.cz magazine who initiated the project within the Idnes.cz server, says: “We were literally shocked by interest shown by the public. The video from the stratosphere enchanted almost a quarter of a million online viewers – and that could have been achieved only thanks to the Axis technologies and deployment of the NetRex team.”

Is 6 decagrams enough to transmit from the stratosphere?

During the first phase, the authors of the experiment envisaged only video recording using a GoPro camera. Weight was the main obstacle: The thing is, regulations effective in the Czech Republic prohibit the launch of an unmanned balloon with the overall weight exceeding 3 kg. Therefore, there were only a mere 600 g of weight left for the streaming configuration. If we take into account extreme freezing conditions in the stratosphere, which had actually reached -69°C , and very unstable behavior of a balloon tossed by wind tens of kilometers away from the ground receiver, it seemed that the idea of live streaming was ill-fated. In addition, some members of the realization team did not have confidence in digital broadcasting – use of the IP camera, radio modem, and the 13 cm wavelength band seemed much more problematic than the classical analog transmission. Despite that, the IP technology earned its place in the basket's configuration thanks to experience of the NetRex experts and a lot of discussions between team members. Therefore, in addition to the GoPro Hero 3 camera providing recording only, an AXIS P1214-E Network Camera intended for recording and live streaming, was installed as well.

Space technologies handled by enthusiasts

In addition to camera experts from NetRex, the Stratocaching team also consisted of engineers from the Czech Technical University in Prague and experienced radio communication amateurs. Video transmission would not be possible without a special custom-made multi-polarization antenna placed in the basket whose counterpart consisted of a ground 120 cm parabolic antenna with 27 dBi gain.

However, that is not all. In order not to lose the signal, two independent transmitters of telemetric data using the APRS and RTTY amateur radio communication systems were placed in the basket. The ground station had processed this telemetric data and, using custom-made software, it had controlled a special rotator that had always adjusted the parabolic antenna in the right direction. Therefore, the technology that is otherwise used to receive transmissions from satellites in orbit also served well in this enthusiastic project. The camera team overcame other obstacles derived from the project's unusual assignment as well: AXIS P1214-E, which is used mainly for discreet monitoring of ATMs and similar installations thanks to its miniature size and high-quality image, was supplemented with auxiliary heating via a heating wire and a bimetal thermostat.

Analog system received another blow: It works even from "space"

At the end the result of the experiment exceeded all expectations. The balloon reached the maximum height of 30,722 meters and landed on private land located 47 kilometers away from the start point. For the whole duration of the 117-minute flight, the camera, with the exception of some short black-outs, provided high-quality video streaming with resolution of 1280x800 pixels that was also recorded to the internal 64 GB micro SD card. Radio communication was lost no sooner than several hundred meters above the ground. However, at that time, the basket descending on a parachute was already visible to the organization team, whereas recording on the memory card had been made even in the car while driving back. The live streaming on the Internet was watched by more than 220,000 viewers. In addition, NetRex also added two ground IP cameras (AXIS P5534-E and AXIS P1354) to the stream, and the Idnes.cz viewers had been able to switch among them as they pleased – one streaming from the launch site and one from the control center. Therefore, the whole experiment received unusual publicity – thanks to the advantages of the network video technology.



For more information, see the following links.

Complete video recording from the Axis camera in the balloon's basket:
www.youtube.com/watch?v=AE9kUOGSril

Information on the entire experiment:
www.zadnaveda.cz/stratocaching-1/

Articles in English:
http://technet.idnes.cz/stratocaching-geocaching-from-space-experiment-prague-czech-republic-1kk-/tec_vesmir.aspx?c=A131115_171153_tec_vesmir_pka

http://technet.idnes.cz/first-stratocaching-2013-prague-czech-republic-geocaching-near-space-game-13m-/tec_vesmir.aspx?c=A131118_172217_tec_vesmir_pka

