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LingoCluster — Multi-Channel ONVIF IP Camera Simulator

Up to 48 cameras. One Pi. One cable.

Simulate up to 48 independent ONVIF IP cameras on a single Raspberry Pi 4. Built for VMS/NVR development, interoperability testing, and large-scale stress testing.

Features

- **Like real cameras:** Each camera has its own MAC, IP, UUID, and serial number, with independent ONVIF Discovery and Device Management services, so your VMS sees separate devices.
- **Streams:** Dual streams (main + sub). Resolution, bitrate, and frame rate follow your clips (4K clips supported, camera count varies with resolution).
- **48 cameras, one cable:** Up to 48 × 1080p30 streams (tested) in H.264 or H.265 through the Pi's built-in Gigabit port, using about 10% of its bandwidth.
- **No transcoding:** Pre-encoded video keeps the load light, and ONVIF encoder changes switch to matching clips, just like a real camera.
- **Events on demand:** Fire motion or tampering (image too dark) events, once or on repeat, across selected or all cameras to stress-test VMS alarm handling.
- **Your own footage:** Upload your video clips and loop them on any camera for realistic test scenes.
- **Deploy and reset in minutes:** Docker-based, with a Web UI to batch-create cameras with automatic naming (lobby01, lobby02…), then start, stop, restart, reset, and monitor them individually or all at once.

ONVIF Profile S / T mandatory features · H.264 / H.265 / MJPEG · RTSP · DHCP or static IP

Need Higher Density?
LingoCluster also runs on Raspberry Pi 5 for higher camera counts. Customization available for specific test requirements.
Contact Lingodigit Co., Ltd. — Embedded Linux and ONVIF software outsourcing,
Taiwan https://lingodigit.com · info@lingodigit.com

Tested Performance

Max cameras (Pi 4) 48 at 1080p30 (validated, single stream) · 32 (main + sub stream)

Measured on Raspberry Pi 4 (Debian 13, Docker 26.1.5) via the built-in Gigabit Ethernet port. stream1 = 1080p @ 30 fps, 2,000 kbps · stream2 = 360p, 600 kbps

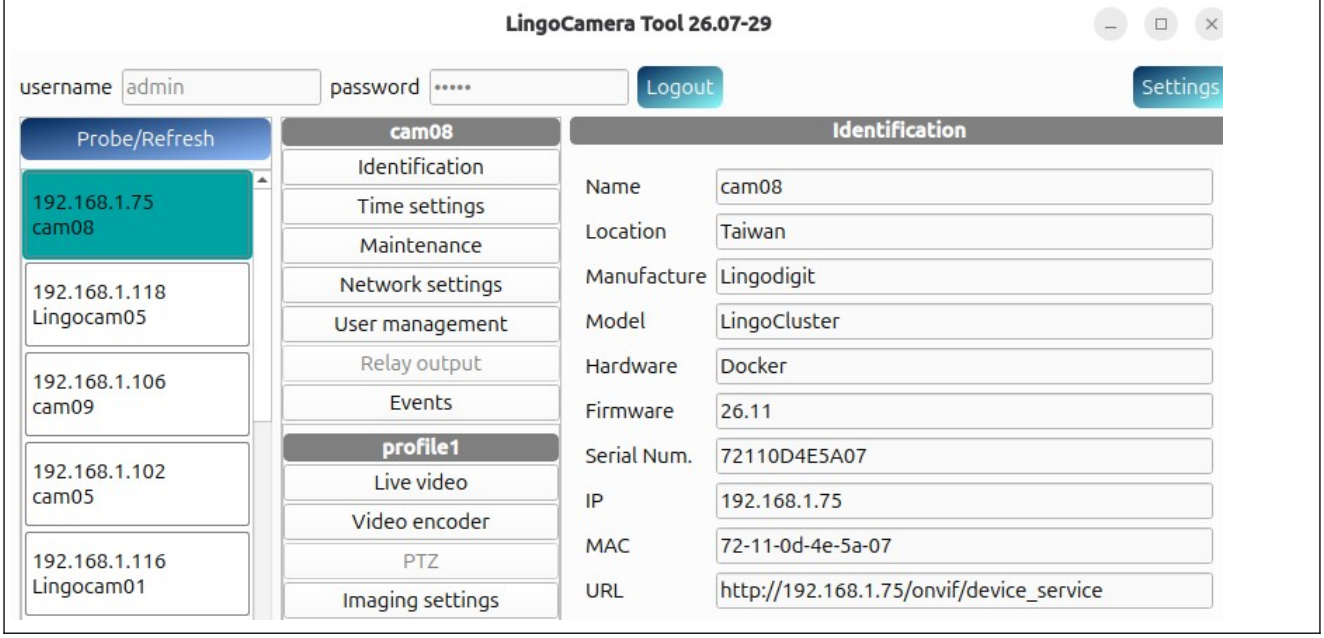
Scenario	Cameras	Streams per camera	GStreamer pipelines	CPU avg	RAM	Network
Main + sub stream (H.264)	32	stream1 H.264 + stream2 H.264	64	84.9%	969 MB	91.4 Mbps
Main + sub stream (H.265)	32	stream1 H.265 + stream2 H.264	64	75.6%	964 MB	90 Mbps
Maximum density (H.264)	48	stream1 H.264	48	77.5%	1,249 MB	104 Mbps
Maximum density (H.265)	48	stream1 H.265	48	66.7%	1,283 MB	102 Mbps

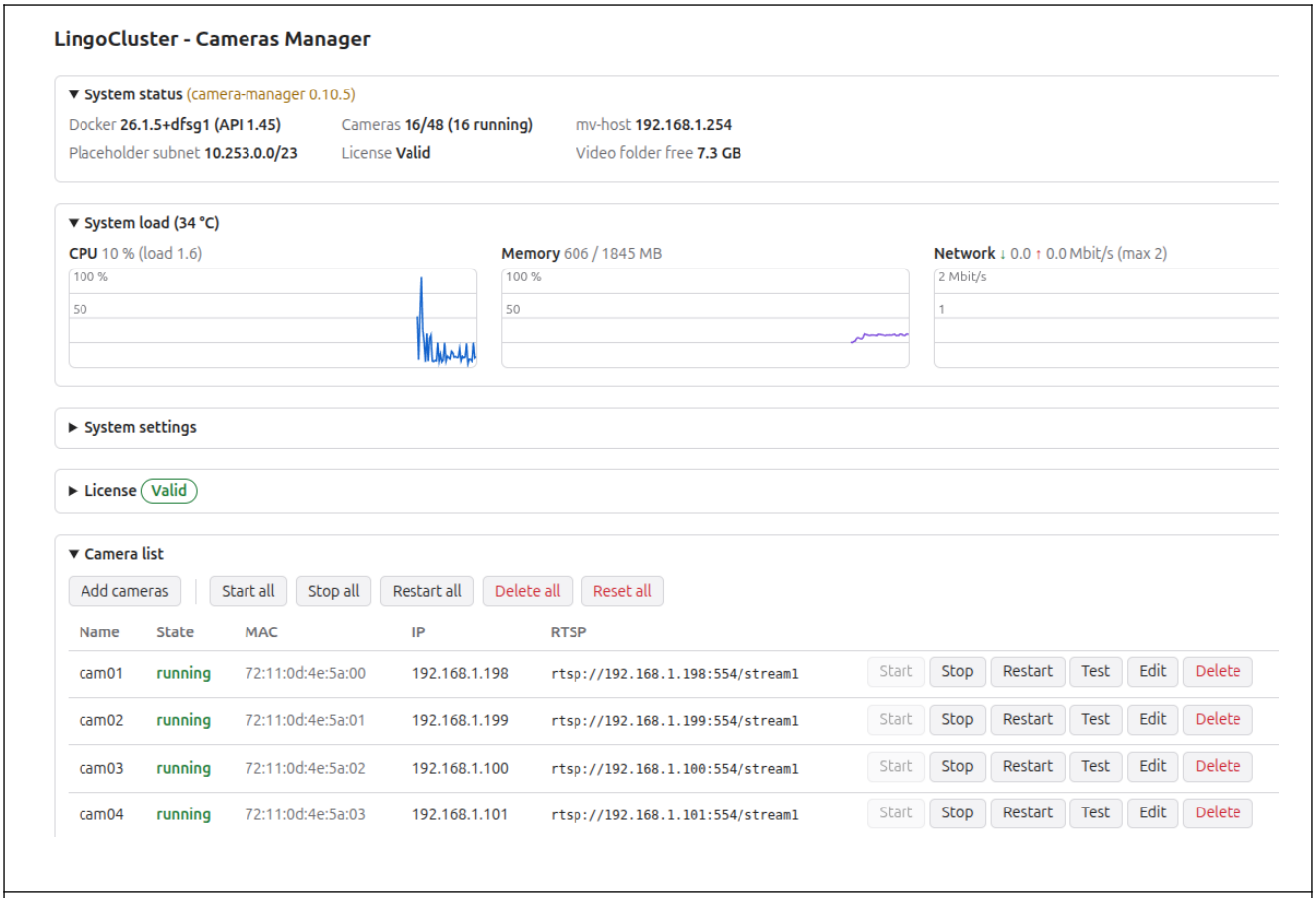
Network usage stays near 10% of Gigabit capacity, so CPU is the limiting resource. Clients received streams without decoding.

Quick-Reference Operation Guide

LingoCameraTool (Lingodigit's ONVIF client, used here as the VMS)

Like real cameras: Each camera has its own MAC, IP, UUID, and serial number, with independent **ONVIF Discovery and Device Management services**.

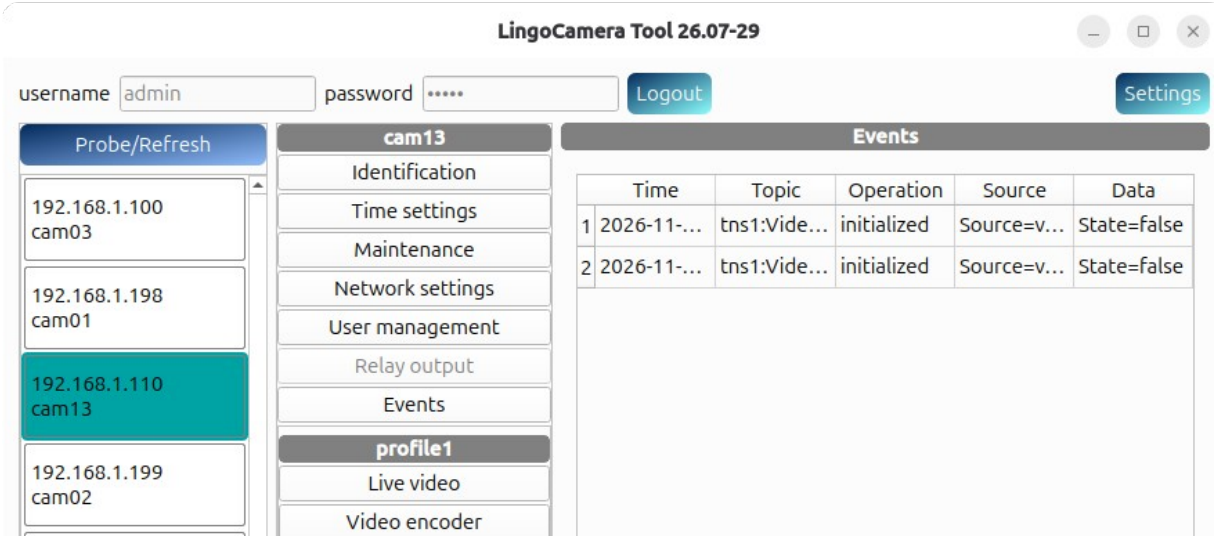




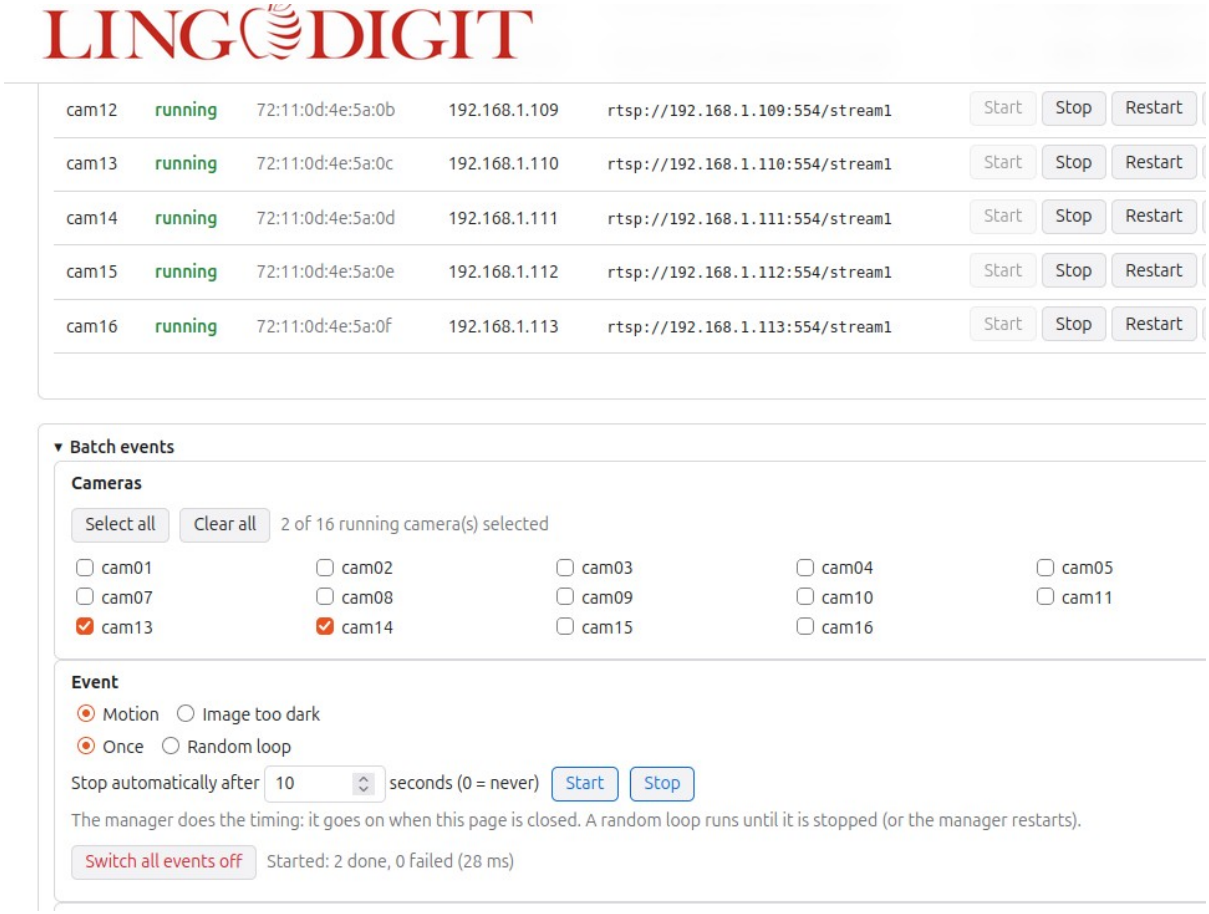
Events on demand: Fire motion or tampering (image too dark) events, once or on repeat, across selected or all cameras to stress-test VMS alarm handling.

Testing events:

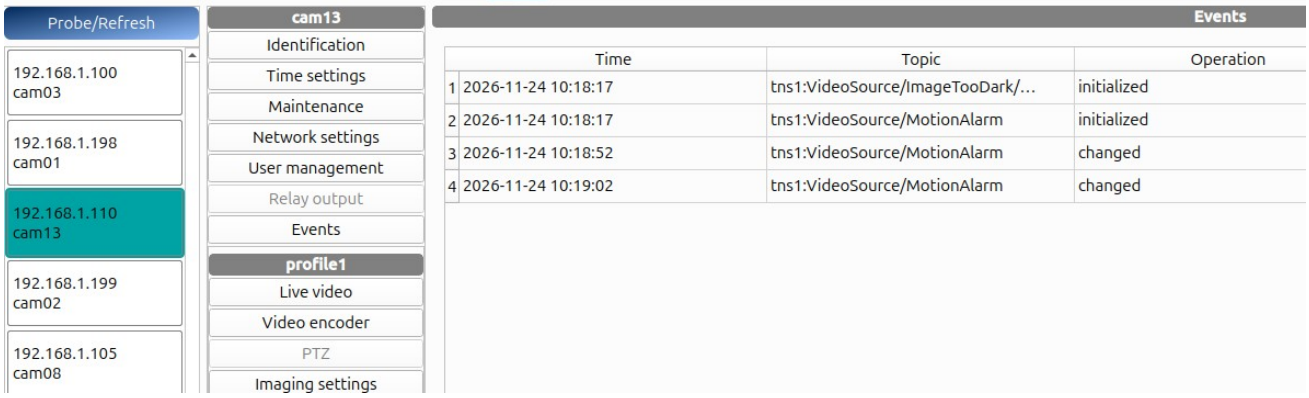
1. In LingoCameraTool, log in with the ONVIF account and open **Events**. Initial event states appear as "initialized".



2. In LingoCluster Cameras Manager, open **Batch events**, select the cameras (here, cam13 and cam14), choose the event type, and click **Start**.

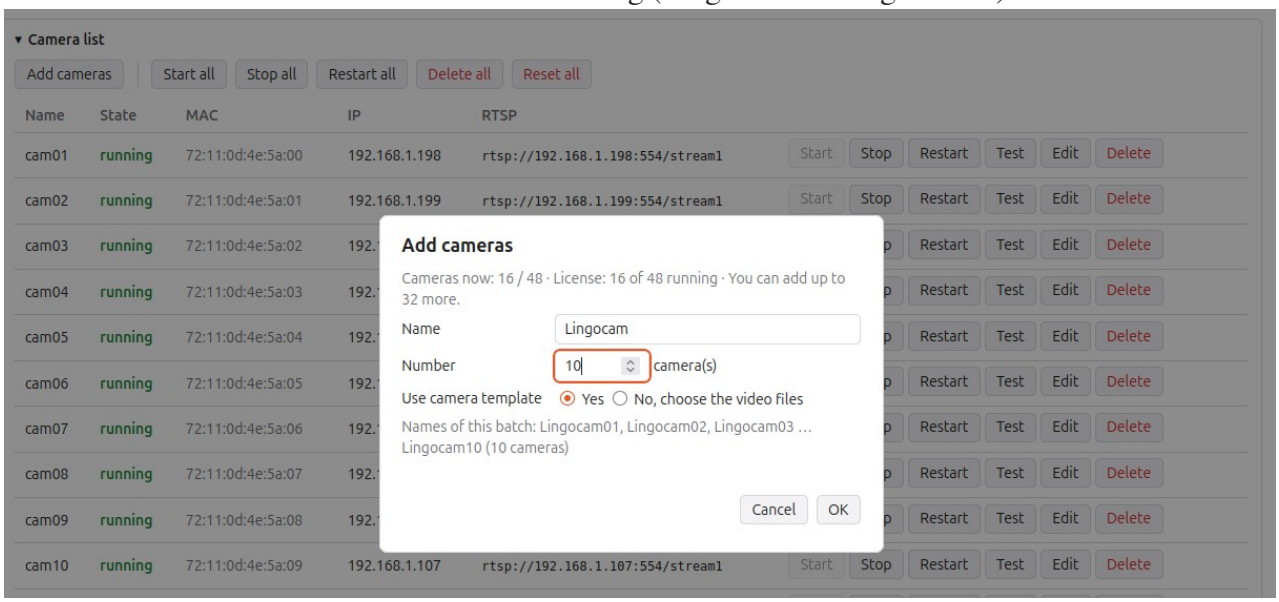


3. LingoCameraTool receives the events via the ONVIF event service, shown as "changed".



Deploy and reset in minutes:

1. Batch-create 10 cameras with automatic naming (Lingocam01–Lingocam10):



2. Cameras start automatically and get IPs via DHCP within seconds ("?" until assigned):



3. All 10 cameras are running, each with its own IP and RTSP stream:

