

The invention of the network camera

and the VLSI technology behind

Stefan.Lundberg at axis.com

Oct 2015

Axis Mission



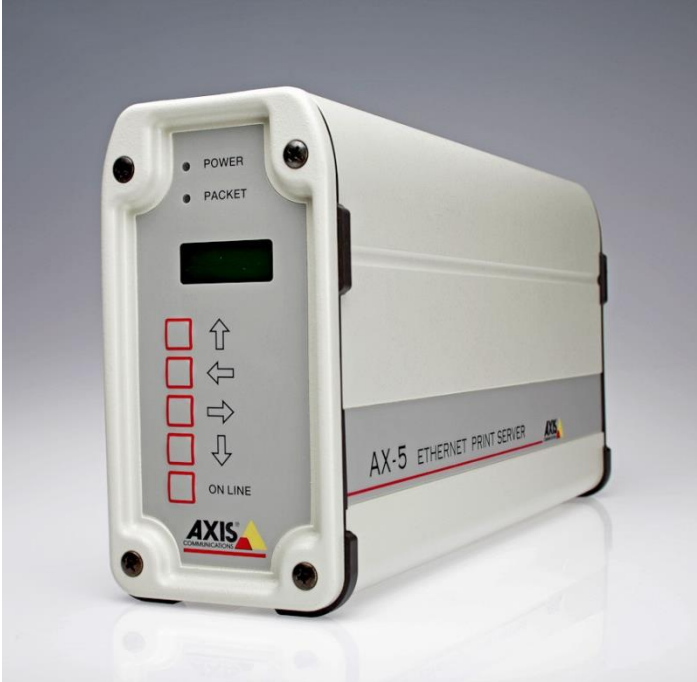
Together, we pioneer intelligent network technology, creating unique possibilities for partners, end users and employees.

Axis

- > Founded in 1984 at IDEON in Lund
- > IT company focused on Network Video Solutions
- > 2061 employees (Q2, 2015)
- > Sales 2014, 5500 MSEK
- > Listed on NASDAQ OMX under acquisition by Canon
- > Head office in Lund, close to LTH
- > Own offices in more than 40 countries
- > 75000 partners in 179 countries



Original products



The market's broadest portfolio



Fixed
cameras



Thermal
cameras



Encoders/
decoders

Fixed dome
cameras



Onboard
cameras



Software &
recording



PTZ cameras



Accessories



Physical
access control

AXIS V59 PTZ Network Camera Series



For high-quality streaming and webcasting

- > Easy to integrate with other systems and share information
- > Perfect for auditoriums, classrooms, as well as peer-to-peer communication in video conferencing
- > Up to 1080p HDTV resolution with smooth pan/tilt/zoom and high quality audio

AXIS A8004-VE Network Door Controller



Reliable audio visual identification and entry control

- > A perfect complement to any surveillance installation to effectively control entry:
 - Identify and talk to visitors
 - Record what happens at the entrances
- > Suitable for small- and mid-size installations as well as advanced enterprise systems

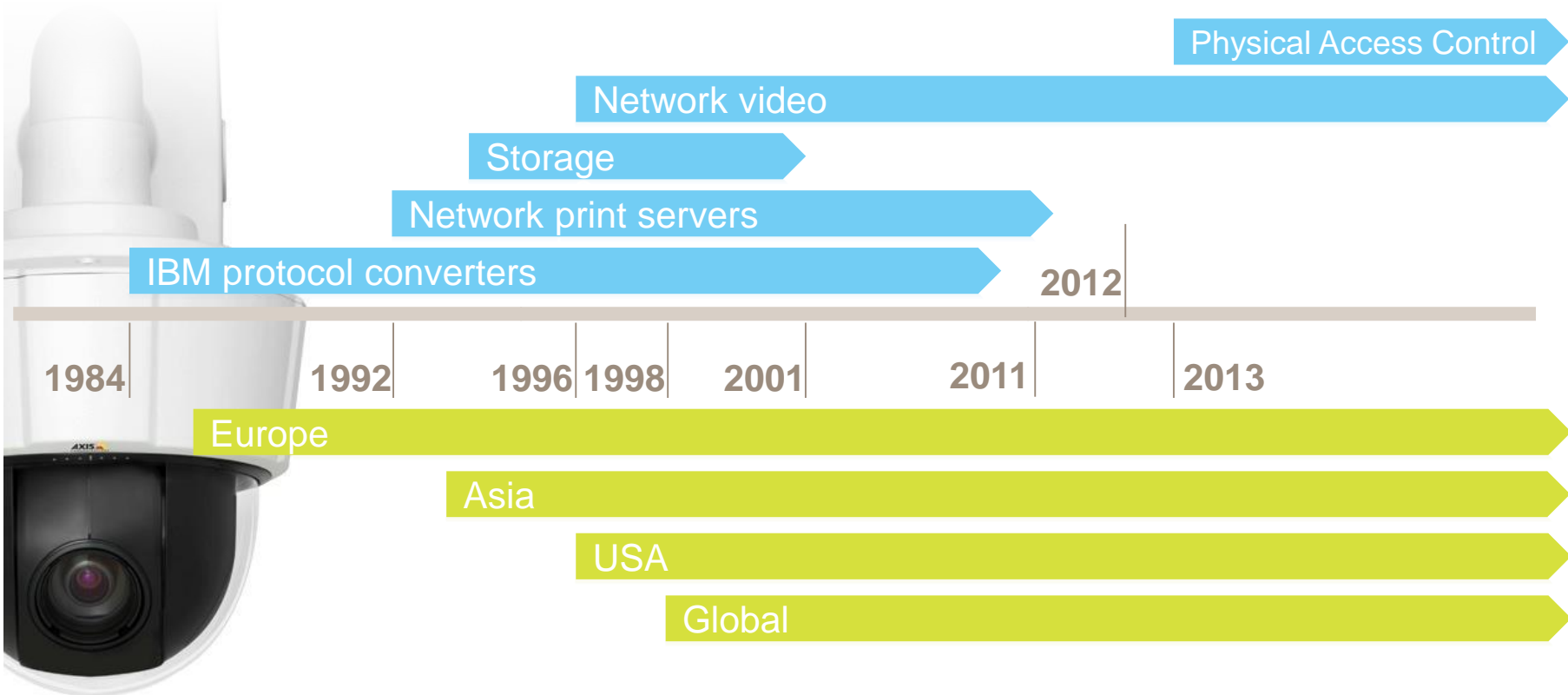
AXIS Q3709-PVE Network Camera



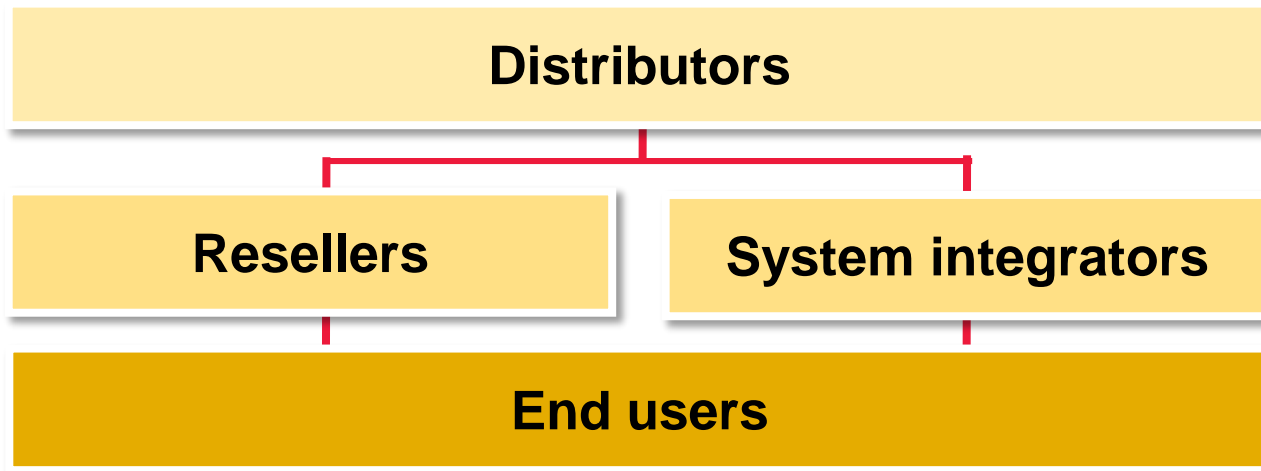
**Multi-sensor, multi-megapixel - 180° overview.
One camera.**

- > 180° panoramic **overview**
- > Smooth video of movements at up to **30 fps in 3 x 4K**
- > Efficient one-camera **installation**

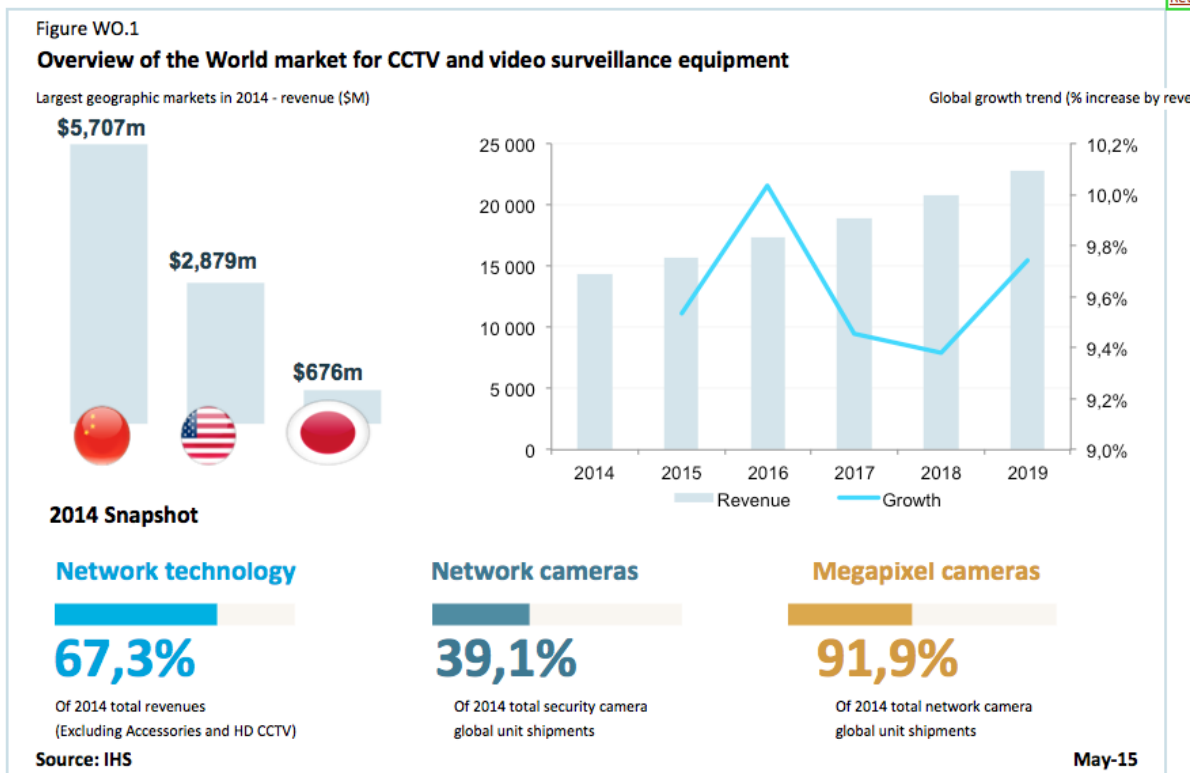
30 years of intelligent networks



Global distribution & sales (Business model)

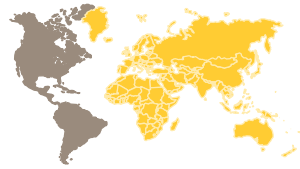


Global overview



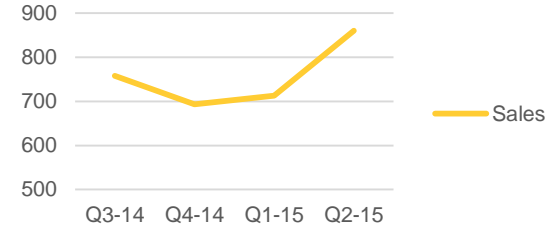
IHS CCTV and Video Surveillance Equipment, 2015

Regional development Q2, 2015



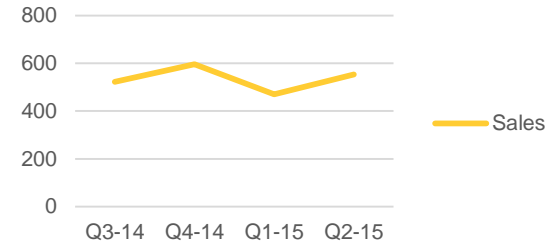
Americas
53%
of sales

- > Total sales of 860 MSEK (700)
- > Growth of 23%
- > Local growth of -5%



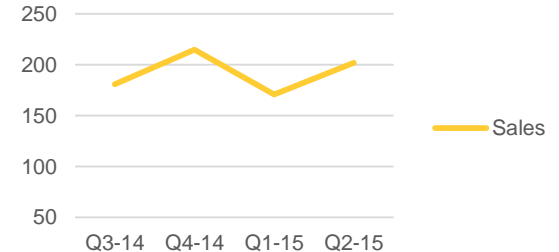
EMEA
34%
of sales

- > Total sales of 554 MSEK (479)
- > Growth of 16%
- > Local growth of 6%



Asia
13%
of sales

- > Total sales of 202 MSEK (176)
- > Growth of 15%
- > Local growth of -9%



Network cameras, security cameras and video encoders (Asia)

Market leadership			
Rank	Network cameras	Security cameras	Video encoders
1	Hikvision	Hikvision	Hikvision
2	Dahua	Dahua	Uniview
3	Panasonic Systems Communications	Panasonic Systems Communications	Kedacom
4	Uniview	Samsung Techwin	Axis Communications Tiandy
5	Samsung techwin	Uniview	Mitsubishi Electric
6	Axis Communications	Axis Communications	Dahua

IHS CCTV and Video Surveillance Equipment, 2015

Network cameras, security cameras and video encoders (Americas)

Market leadership

Rank	Network cameras	Security cameras	Video encoders
1	Axis Communications	Axis Communications	Axis Communications
2	Panasonic System Communications	Pelco (by Schneider Electric)	NICE Systems
3	Sony Corporation	Panasonic System Communications	Verint Systems
4	Bosch Security Systems	Bosch Security Systems	Bosch Security Systems
5	Avigilon	Samsung Techwin	Avigilon

IHS CCTV and Video Surveillance Equipment, 2015

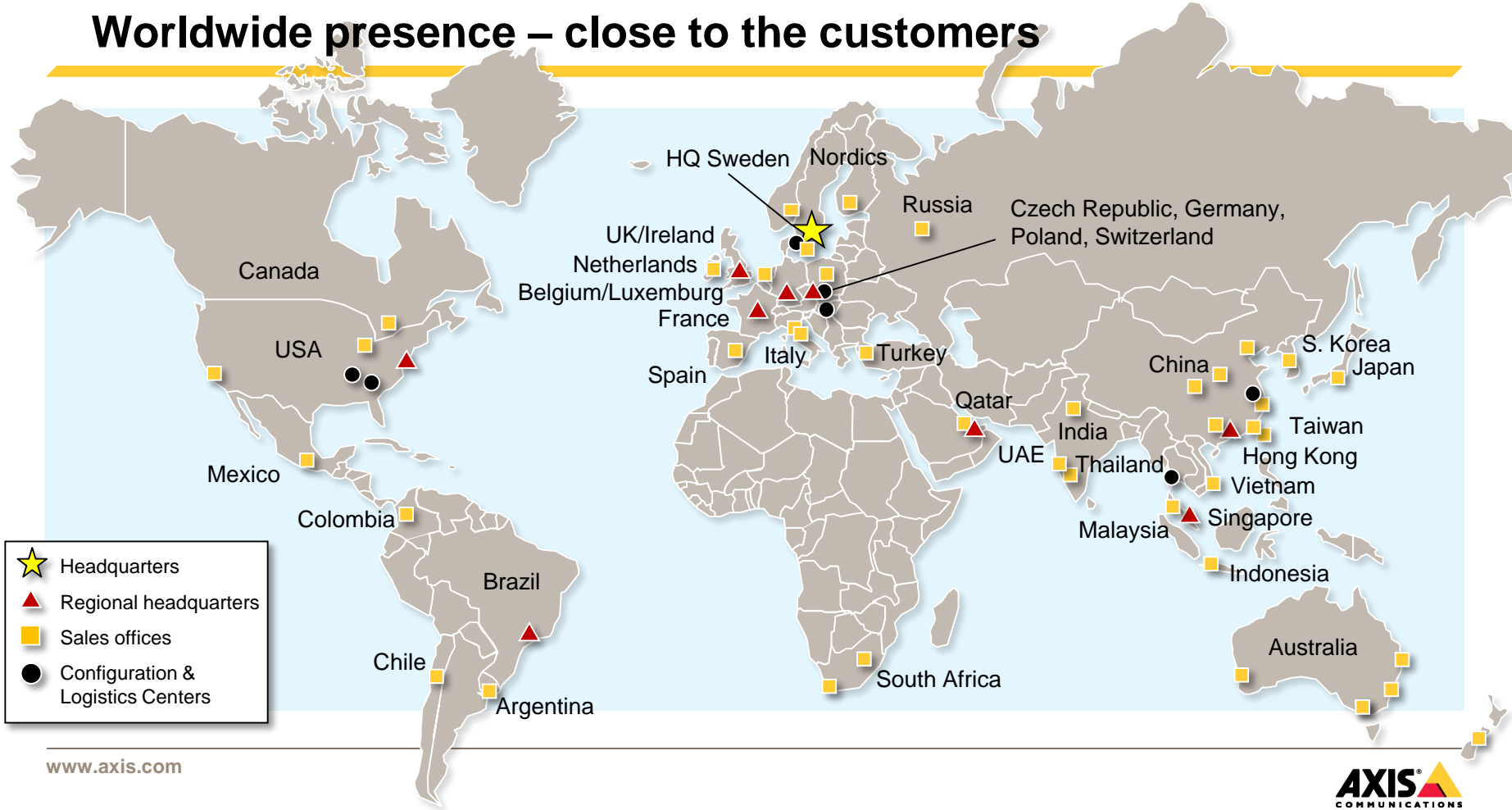
Network cameras, security cameras and video encoders (EMEA)

Market leadership

Rank	Network cameras	Security cameras	Video encoders
1	Axis Communications	Axis Communications	Axis Communications
2	Hikvision	Hikvision	TKH Group
3	Bosch Security Systems	Bosch Security Systems	Bosch Security Systems
4	Mobotix	Samsung Techwin	NICE Systems
5	Sony Electronics	Mobotix	Teleste

IHS CCTV and Video Surveillance Equipment, 2015

Worldwide presence – close to the customers



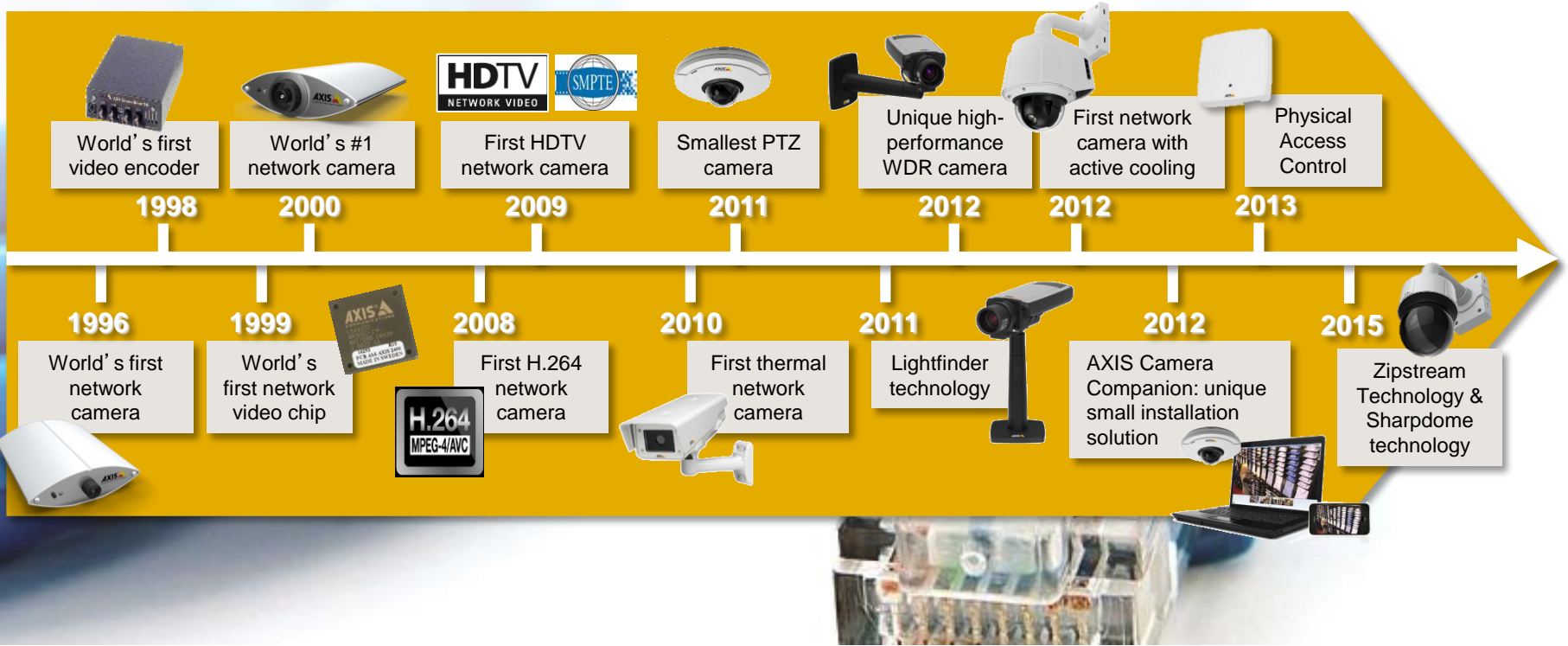
- ★ Headquarters
- ▲ Regional headquarters
- Sales offices
- Configuration & Logistics Centers

Taking long-term responsibility by thinking big

Sustainability highlights

- > Continued to enhance and reduce product packaging
- > Optimized logistics
- > Energy-efficient, more environmentally friendly products
- > Anti-Corruption policy

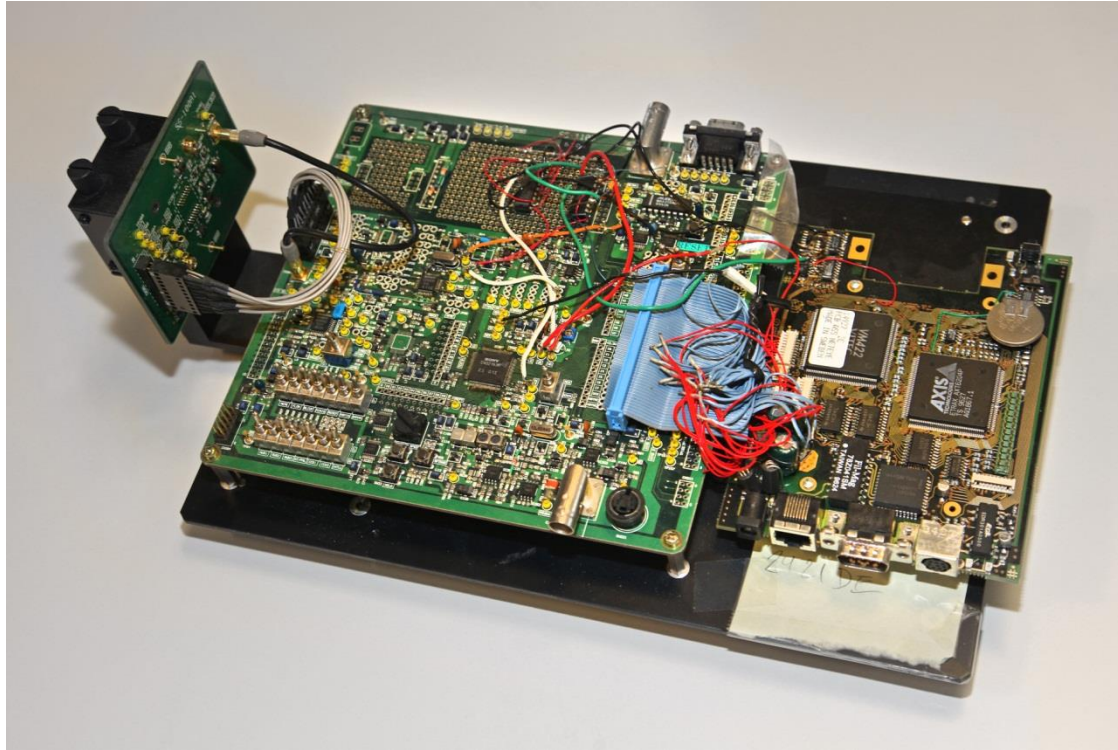
Since 1996, Axis has been driving Network Video evolution



Axis – continuously driving innovation in network video



The fourth phase - the invention of the network camera



1996 - AXIS NetEye 200

- > The world's first network camera
- > Launched at Interop Atlanta, September 18th, 1996
- > Performance
 - 1 image/second in 352*288 pixel
 - 3 frames/minute in 0.4 Mpixel



More than 10,000 sold!

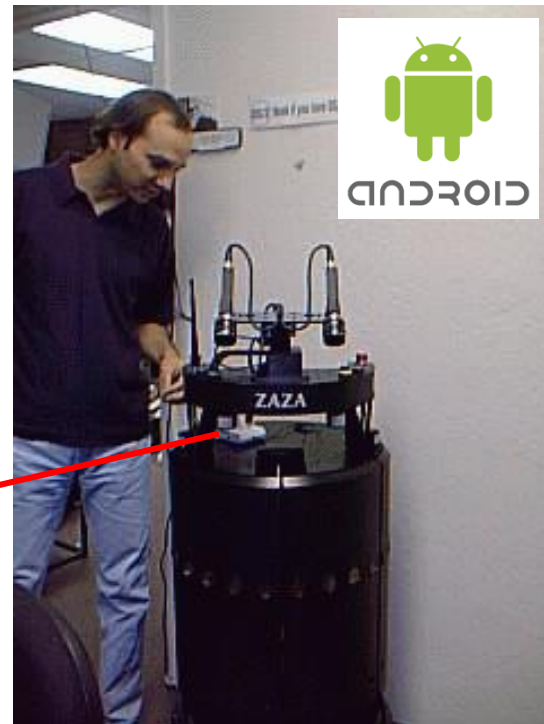
One of our first camera customers...

- > Steve Wozniak, co-founder of Apple
- > Was in a car accident during a tech support call
- > No injuries and problem was solved



World's first video encoder in 1998

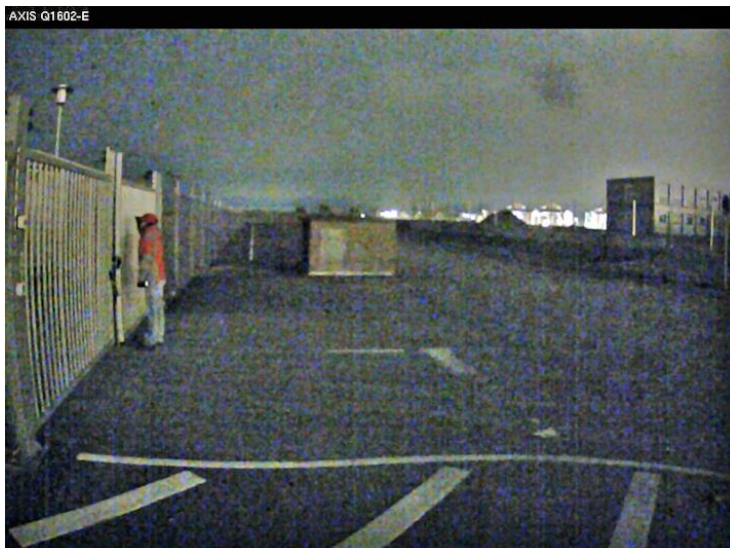
- > AXIS 240 – the world's first video encoder
- > Andy Rubin, CTO & founder of Android at Google, in 1997 when he was testing AXIS 240 prototypes



Lightfinder technology, Wall Street Journal Technology Innovation Award



AXIS 221



AXIS Q1602

Perimeter surveillance with no street illumination during night time and approximately 0.1 lux.



In-house R&D – where the coming successes are made

- > Substantial R&D investment
 - 15% of revenue
- > Strong network camera patent portfolio
- > Canon is very strong on patents
- > 3 corner stones
 - Innovation
 - Openness
 - Quality

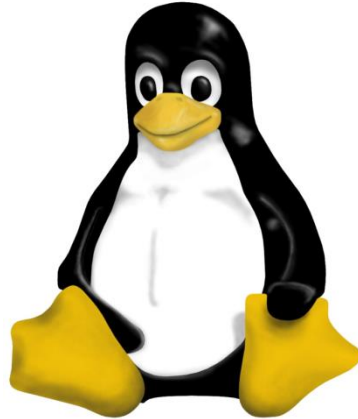


Approx. 800 engineers work in Lund

Mechanics



Software



Electronics

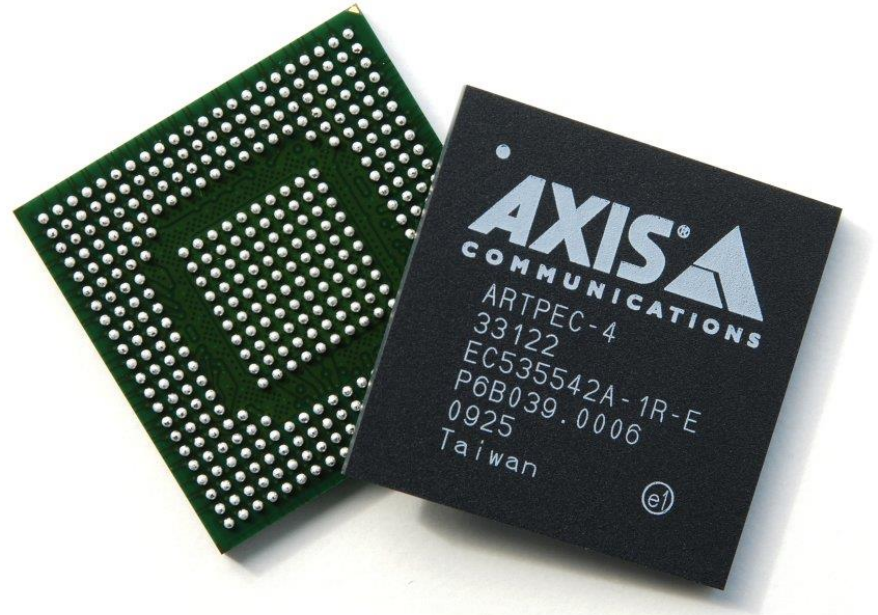


ASIC's



SoC content

- > Embedded CPU running Linux
- > Image processing pipeline
- > Image scaler with dewarping
- > Image compression subsystem
- > Crypto accelerator
- > Ethernet controller
- > I/O controller
- > Interfaces etc



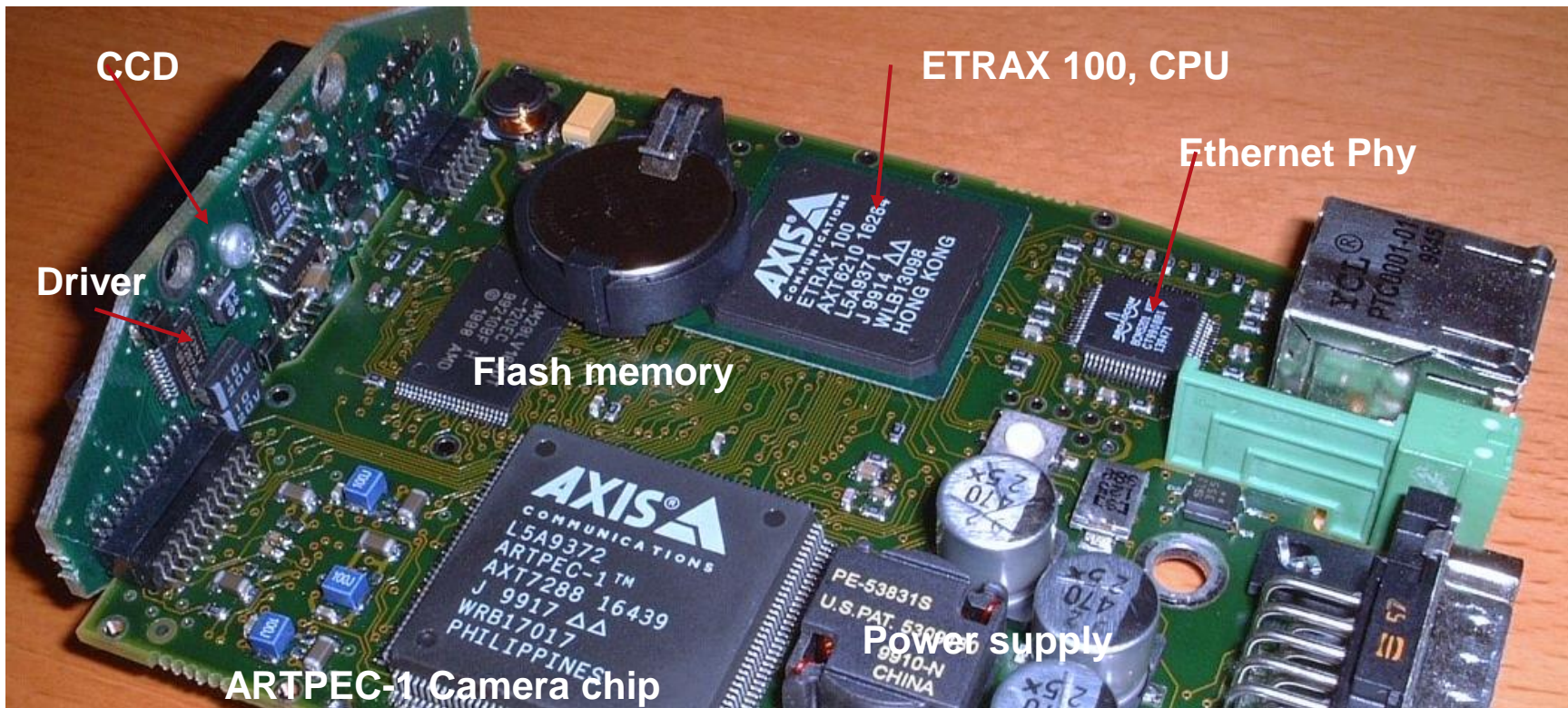
ARTPEC 1 - 5



- > Five generations of dedicated network camera ASIC's



ARTPEC-1 product

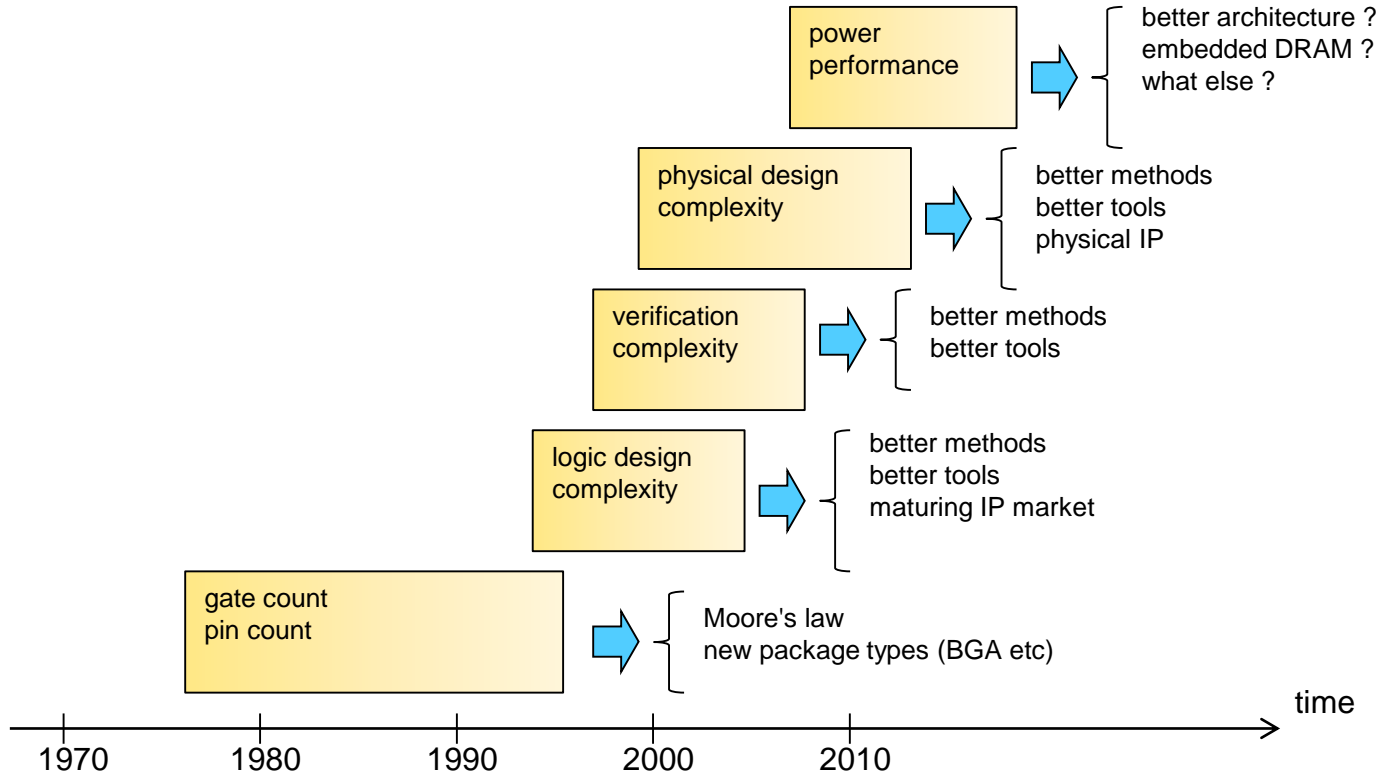


ASIC challenges

- > Price/Volume
- > Complexity
- > Project size
- > Project time
- > Tools
- > Power
- > Shrink
- > Technology

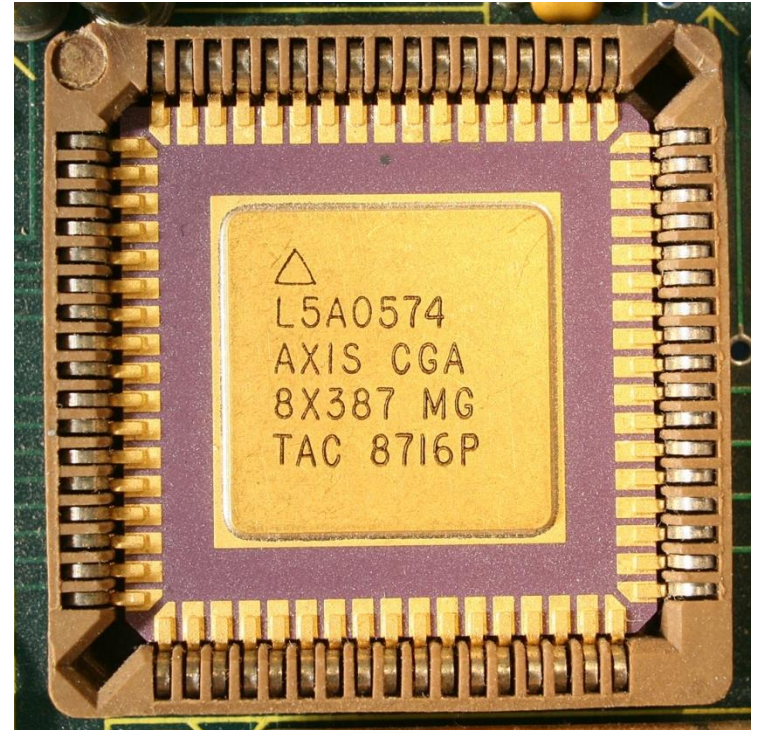


Electronic design obstacles, history and future



Development challenges

- > Distance to production
- > China
- > Open source
- > Free information
- > Crowd founding (Kickstarter etc)
- > Time to market
- > Quality



Consumer Electronics Trends

> Staying Connected

- Consumers want to stay connected, at home and while traveling.
- Portable equipment with the latest features (More important than ever)

> Media and Data Convergence

- Media-centric TV and the data-centric computer will merge.
- New gadgets has to handle both types of tasks and be synchronized

> In-Home Entertainment

- 1080p will be replaced by 4K
- Video/Movies/Music on demand
- User interface centric equipment

> Smart home

- Embedded devices for everything
- Smart/Cost-efficient device integration



More trends

> IT

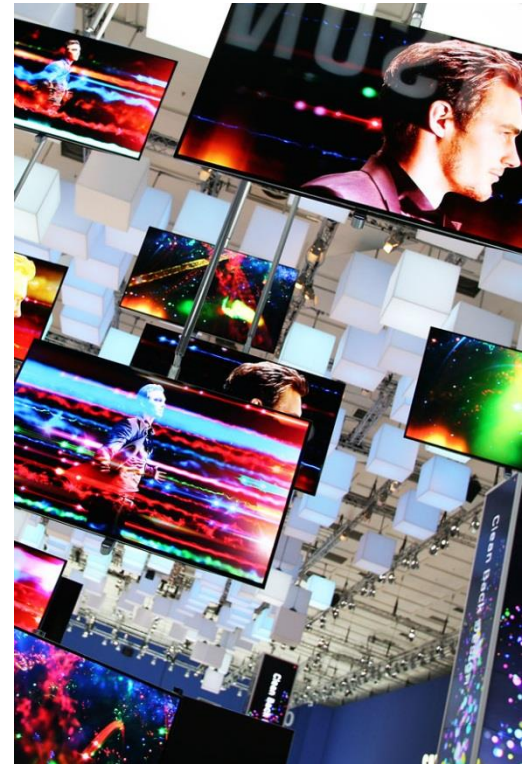
- Cheaper and better tablets and computers
- Moving to App-oriented business models
- Corporate cloud solutions
- Wider use of P2P/streaming media

> **Mobile communications**

- Phone will be user-interface for everything
- Mobile payments (ApplePay)
- IPv6
- Wearable devices (Google Glass, Apple Watch...)
- Real time automatic voice translation

> **Other**

- 3D printing
- Autonomous flying robots (Drones)



Industry Trends in Consumer Electronics

- > Difficult to earn money on software
 - App-centric world
 - Customer lock-in
 - Force customer to the cloud
- > Business critical technology development
 - Vertically oriented business trend
 - Apple, Microsoft...
 - Outsourced development is now moved home
- > IPR
 - Patents



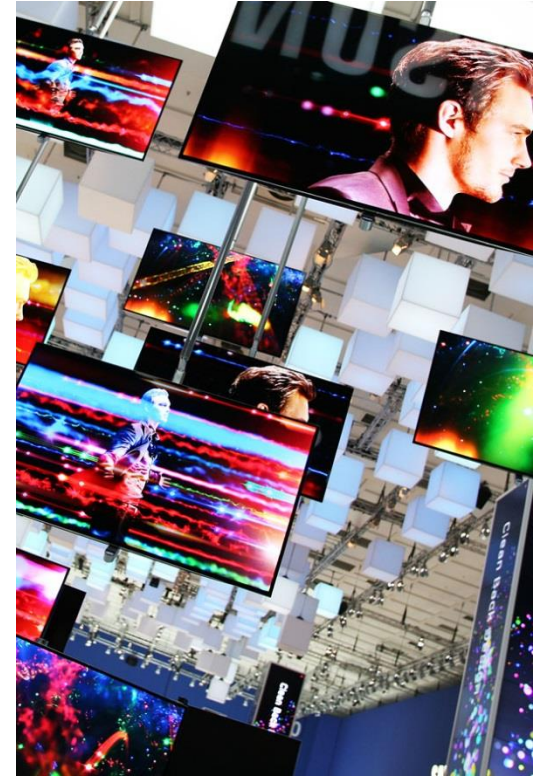
Ultra high definition television according to IHS/iSuppli

- Aggressive 4K rollout
- Old pixel technology (TFT, TN, IPS, etc)
- OLED is not mature enough yet
- Quantum dots are enhancing LCD technology
- Lack of content, yield issues
- From Q3 2013 every major manufacturer has 4K in production
- 50" and bigger
- 50% higher panel cost
- 4K World market estimates 4% 2014 8% 2015 15% 2016
- Apple is leading the hires conversion

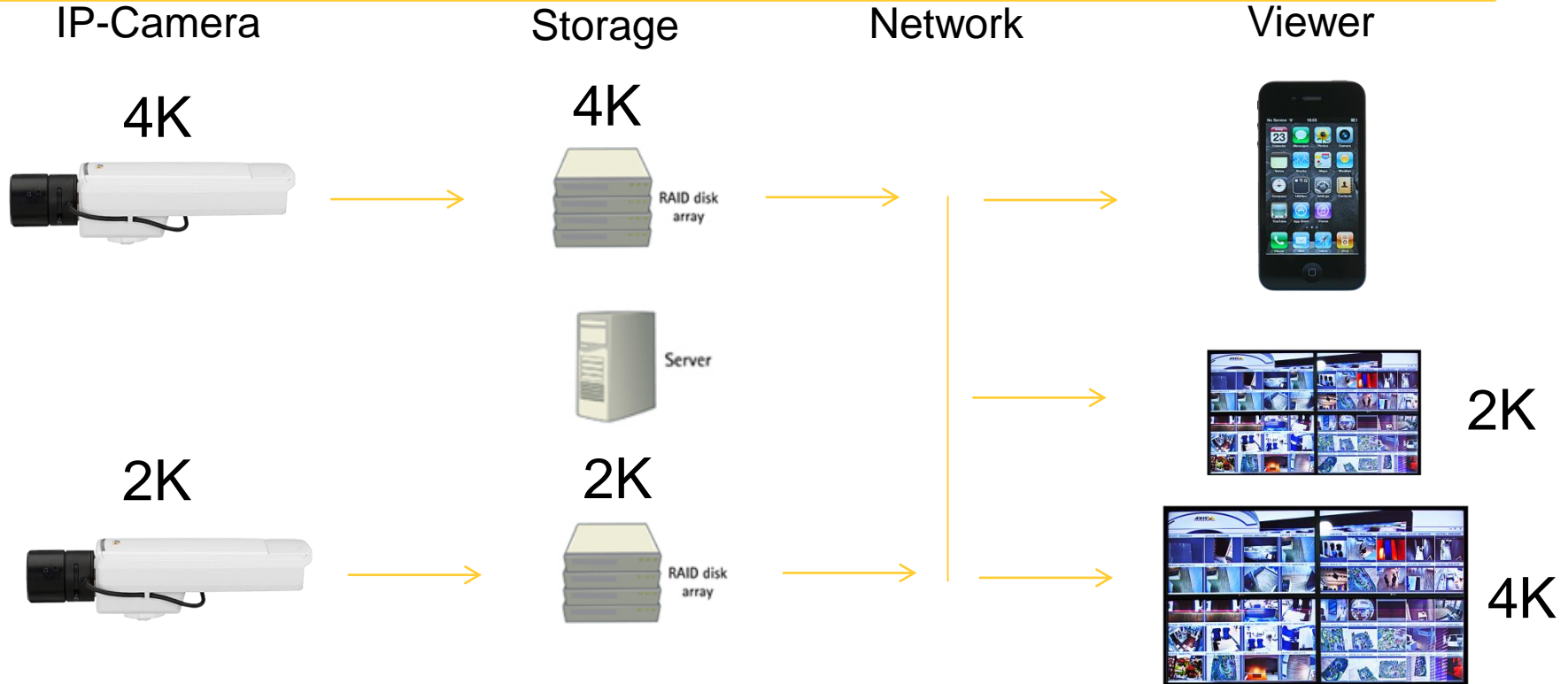


4K key selling arguments

- Easy in store demo:
 - visible difference 0.5-2m from the screen
- Lack of content has never stopped set makers before
- Up scaling looks great
- 4K production is much more easy than 3D
- Blu-ray benefit from 4K up scaling
- Ultra Blu-ray player launched at IFA 2015
- PC and consoles will soon be 4K
- Consumers want to be future proof
- Still images on 4K display is perfect
- 4K display with proper content gives 3D feeling



Axis view on 4K / Ultra-HD



Display technology

- > Important part of surveillance system
- > Industry update (Status, Players, jobs)
- > Display market update (Outlook, Problem, Solution)
- > OLED
- > Trends (Flexible, Unbreakable, See-through, Touch)



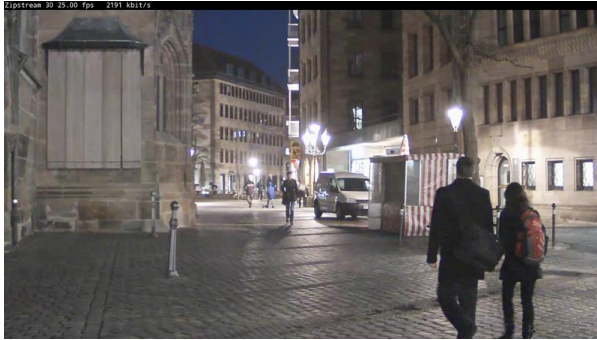
Innovative product portfolio

Axis' Zipstream technology – More video, less storage

- > Reduce storage and bandwidth by an average 50% or more
 - Optimized for video surveillance
 - Fully compatible with H.264
 - New unique method
 - Acts on motion, details and noise
 - Radically lowering bandwidth and storage
 - Keep the essence



How much do I gain?



City surveillance:

Street level recording with small movements most of the time

Zipstream strength:

High

Dynamic GOP:

On

60%



Outdoor VMD triggered recording:

Night time, average reduction for 12h surveillance.

Zipstream strength:

High

Dynamic GOP:

On

75%

How much do I gain?



Transportation:

Onboard a train, continuously recording during daytime.

Zipstream strength:

High

Dynamic GOP:

On

35%



Transportation:

Airport at night, continuous recording when preparing a plane for takeoff.

Zipstream strength:

High

Dynamic GOP:

On

80%

Huge saving in average file size (still images)

> Zipstream disabled: 2881 kbit/s



> Zipstream enabled: 1433 kbit/s

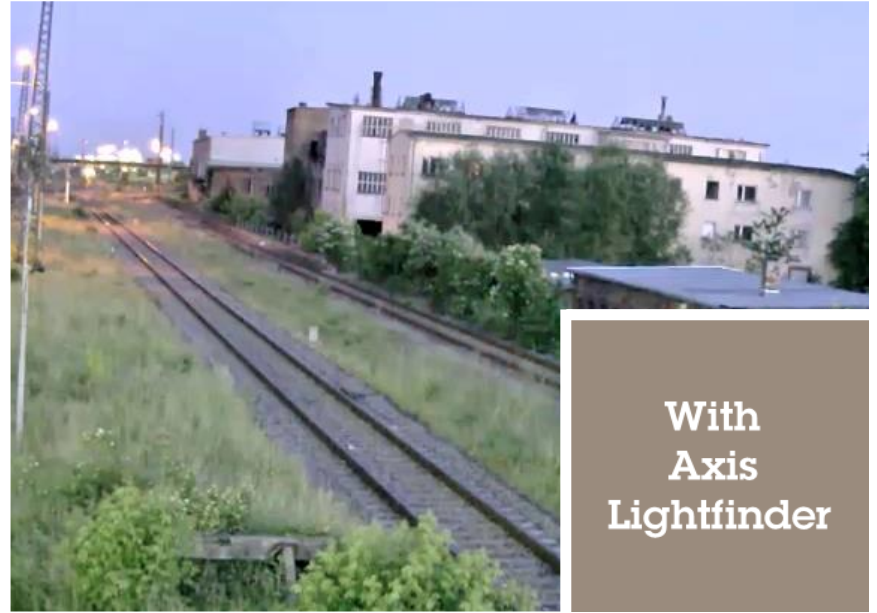


Zipstream SIA award @ ISC-West Las Vegas



Best new product for Video Surveillance Advanced Imaging Technologies 2015

Lightfinder technology – an Axis innovation



Extreme light sensitivity

Thermal network cameras – an Axis innovation

24/7 detection in tough conditions

- > Bright lights
- > Deep shadows
- > Rain, snow and fog
- > Smoke



Thermal
camera OFF



Thermal
camera ON



