



## Quality-of-Experience and Product Performance Testing

Starting at 11:30

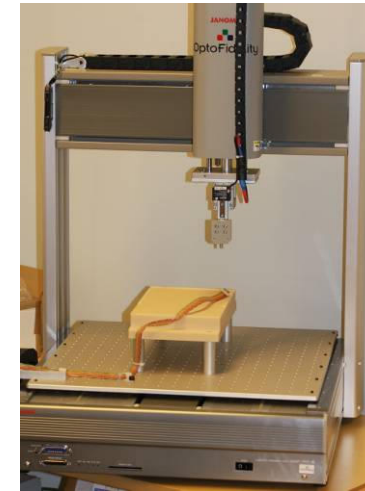
Hans Kuosmanen  
Program Manager, Test Systems  
OptoFidelity Ltd.

# Presentation topics

- > Introduction
- > What is QoE
- > Some QoE parameter metrics in mobile multimedia device:
  - Video frame rate
  - Perceived video quality
  - UI performance
- > OptoFidelity FRM120
- > OptoFidelity AV100
- > OptoFidelity WatchDog

# OptoFidelity Ltd

- > Hans Kuosmanen
- > Program Manager, Test Systems
- > Automated test systems for R&D and production
  - Camera, display, video, sensor technologies
- > Machine vision and optical measurement systems
- > Test automation design
- > HW/SW design
- > Training, service and maintenance



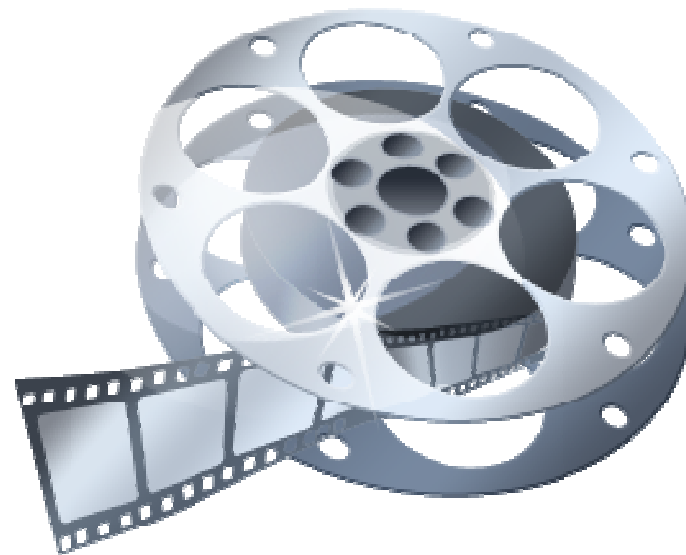
# What is QoE?

- > Quality-of-Experience
  - > Subjective
  - > Defined from customer's perspective
  - > Quality as perceived
- > Quality-of-Service
  - > Objective
  - > Defined from vendor's perspective



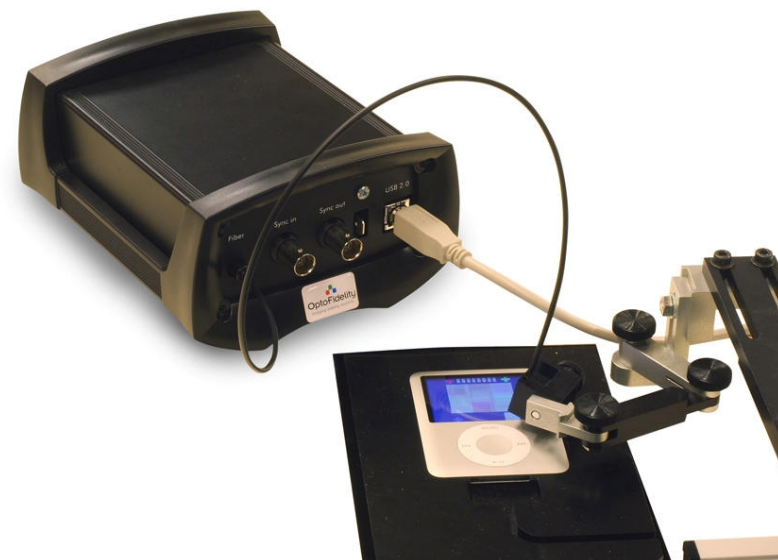
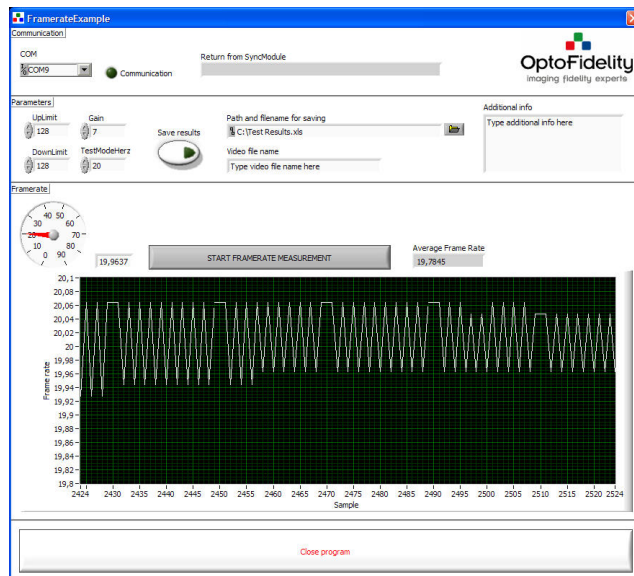
# Video Frame Rate, Overview

- > Major player in perceived quality of video playback
  - Average frame rate
  - Frame rate variation
- > Video out  $\neq$  Display
- > Contributors:
  - Video streaming
  - Video compression
  - Hardware performance issues
  - Software performance issues



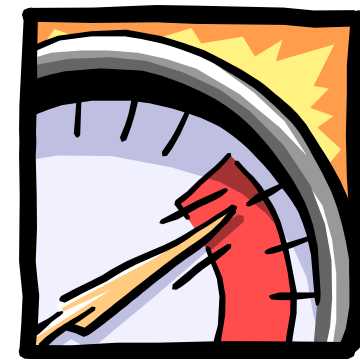
# Video Frame Rate, Application

- > OptoFidelity FRM120 Frame Rate Meter
- > Optical display synchronization
- > No need to modify product
- > Up to 120 frames per second



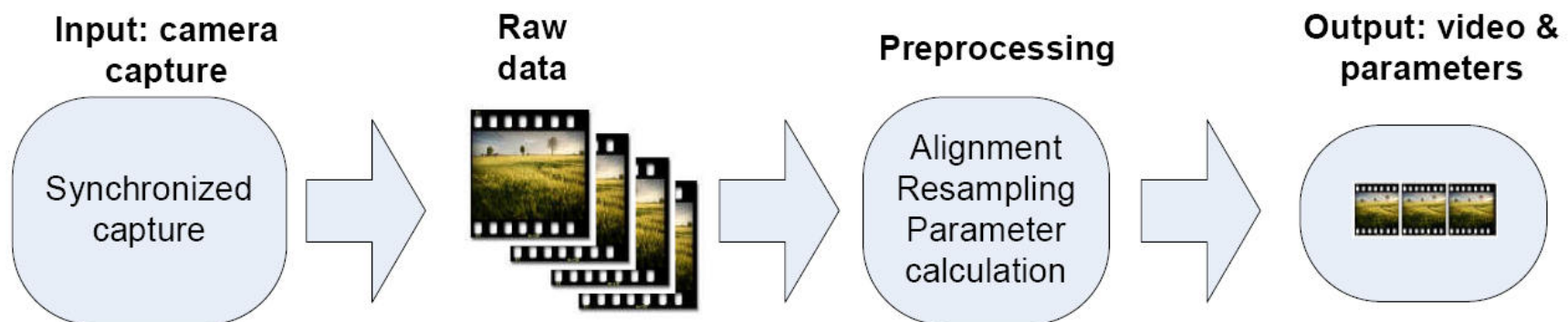
# Perceived Video Quality, Overview

- > ITU-T Recommendation J.247 (08/08)
- > "Objective perceptual multimedia video quality measurement in the presence of a full reference"
- > Specifies how parameters are calculated and combined into a single score representing the overall quality
- > Different playback medium typically has different combination formula
- > MOS, Mean Opinion Score



# Perceived Video Quality, Application

- > OptoFidelity AV100 Video Testing Platform
- > ITU-T J.247 –compatible analysis
- > Unique synchronized camera capture
- > Frame rate measurement





# OptoFidelity AV100, Use Cases

- > Terminal Device Performance Analysis
- > Wireless multimedia device manufacturers
- > Set-top-box and Digital TV manufacturers
- > Content Quality Analysis
- > Network/broadcast equipment manufacturers
- > Codec developers
- > Service providers



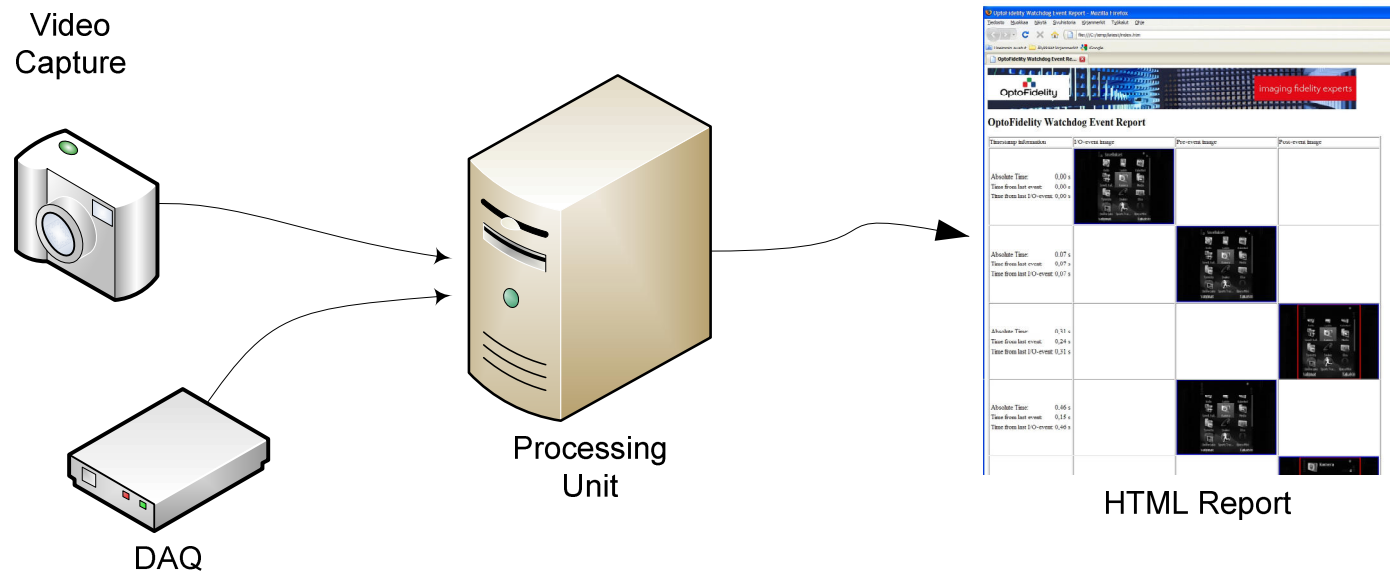
# UI Performance Testing, Methods

- > Typical test methodologies:
  - Special software that produces timestamps
  - Human beings with stopwatches
  - Video filming and post-processing
  - Machine-vision application
  
- > UI testing challenges:
  - Increasing test volumes
  - Outsourcing testing
  - Customizing user interface behaviour per customer









# UI Performance Testing, Application

- > OptoFidelity WatchDog
- > Automatically detects visual events from the UI
- > Links external activities to detected visual events
  - User input, vibra, audio, haptic feedback, external conditions



# OptoFidelity WatchDog

- > Self-learning Event Detection (SLED)
- > Can be applied to any type of user interface
- > Repeatable and reliable results
- > Quick and easy setup and operation
- > No need for any special test features in the device-under-test
- > Automatic report generation

					
0,10 s	Absolute Time: 0,11 s	Absolute Time: 0,12 s	Absolute Time: 0,13 s	Absolute Time: 0,14 s	Absolute Time:
0,10 s	Time from last event: 0,11 s	Time from last event: 0,12 s	Time from last event: 0,13 s	Time from last event: 0,14 s	Time from last eve
0,10 s	Time from last I/O-event: 0,11 s	Time from last I/O-event: 0,12 s	Time from last I/O-event: 0,13 s	Time from last I/O-event: 0,14 s	Time from last I/O

# OptoFidelity WatchDog, Use Cases

- > Product or service benchmarking
- > Competitor analysis
- > Software regression testing
- > Design validation and acceptance
- > Analysing usability
  
- > Functional UI testing
- > Indicator functionality
- > Boot-up process validation
- > Web-service performance testing with multiple clients



# NI Technology Benefits

- > Extensive camera support
  - Grabbers for CameraLink, GigE, FireWire
  - SW-drivers available for thousands of cameras
  - Consistent NI-IMAQ interface
- > Variety of hardware platforms
  - PCI, PCIe, PXI
  - FPGA
  - Smart cameras
- > Extensive data acquisition support
  - Easy to add customer-specific functionality
  - Sensors, industrial automation



# NI Technology Benefits, cont.

- > LabVIEW
  - Graphical SW development
  - Multi-core support
  - Data visualization
  
- > Scalability in hardware
  - LabVIEW works with PC, Smart Cameras, FPGA
  - Tools and interfaces similar across platforms



# Thank you!



- > More information:  
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[hans.kuosmanen@optofidelity.com](mailto:hans.kuosmanen@optofidelity.com)
- > OptoFidelity demos:
  - WatchDog
  - Quality Viewer
  - 3D sensing technology demo
  - Camera Communication Tool
- > Questions?

