# Augmented Reality
Hot Chips 2012
Ben Blachnitzky
Director R&D, Metaio

metaio

- **Founded 2003 out of computer vision research**
- **Privately held, independently financed**
- **500+ B2B customers worldwide**
- **85+ people working in Munich (HQ) and San Francisco**
- **10,000+ active developers worldwide**
- **Extensive R&D department with 100+ patents across 38 different families**
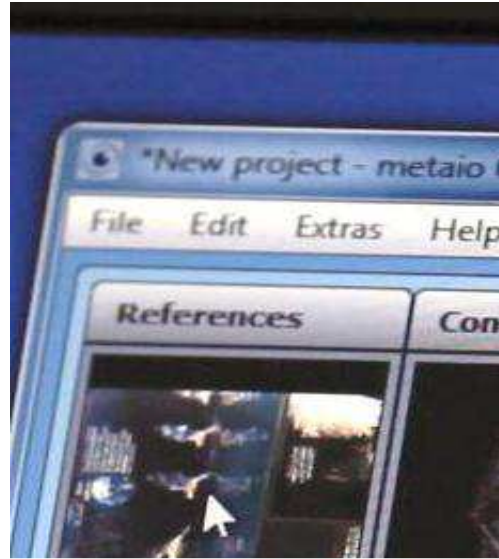- **200+ mobile apps running on metaio technology**

From Hardware to Software to End User
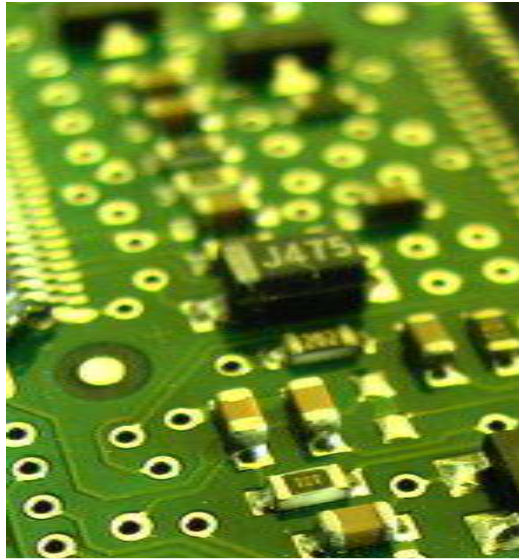
Hardware
AR Devices

Software
AR Applications

Content
AR Usage

Users
AR Monetization

ST ERICSSON

ARM

TEXAS INSTRUMENTS

metaio Mobile SDK

metaio Web SDK

metaio PC SDK

UCHIDA   CYBERNET   GROUPE ON-X

the mass media lab   vanua

DNP Dai Nippon Printing   SENAI-RJ   eria

j.spot

junaio powered by metaio

junaio certified developer

General Milestones

- **Oct. 2011: Won ISMAR tracking competition with pure mobile marker-less tracking**
- **Dec. 2011: mobile SDK 3.0 release**
  - Advanced visual tracking of 2D and 3D objects
  - Gravity aware AR
  - Optimized AR-pipeline for major mobile chipsets (ARM, ST-Ericsson, Texas Instruments)
- **February/March 2012: Augmented City Platform at MWC and SDK 3.1**
  - Advanced 3D object tracking
  - Visual search technology
  - Further hardware optimization on AR-pipeline
- **Estimated Q4 2012: mobile SDK 4.0**

metaio
AUGMENTED SOLUTIONS
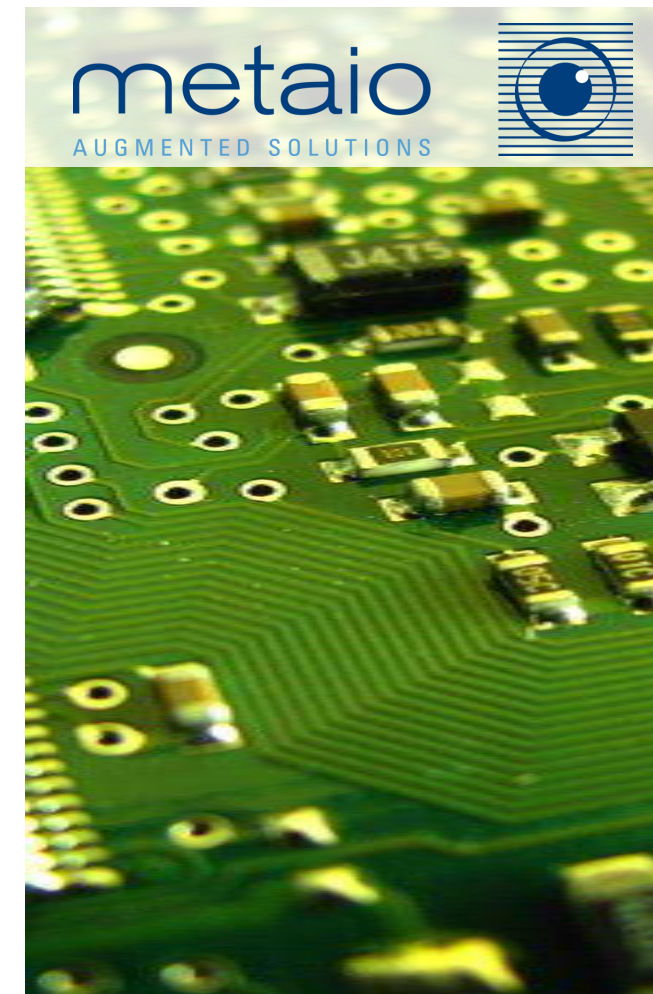
Achievements and Challenges

- **From marker-tracking to full 3D Object Tracking on mobile in only 14 months**

- **Low level optimizations:**
  - Leveraging SIMD extensions (e.g. NEON) for certain computer vision tasks
  - Memory constraints and optimizations especially for large client based visual search
  - General pipeline optimizations and leveraging modern multi-core architectures
  - Optimized camera access for e.g. high-resolution visualization images and lower resolution tracking images

- **Challenges:** Battery consumption & extending the limits of tracking in AR so that it becomes natural for consumers

metaio
AUGMENTED SOLUTIONS
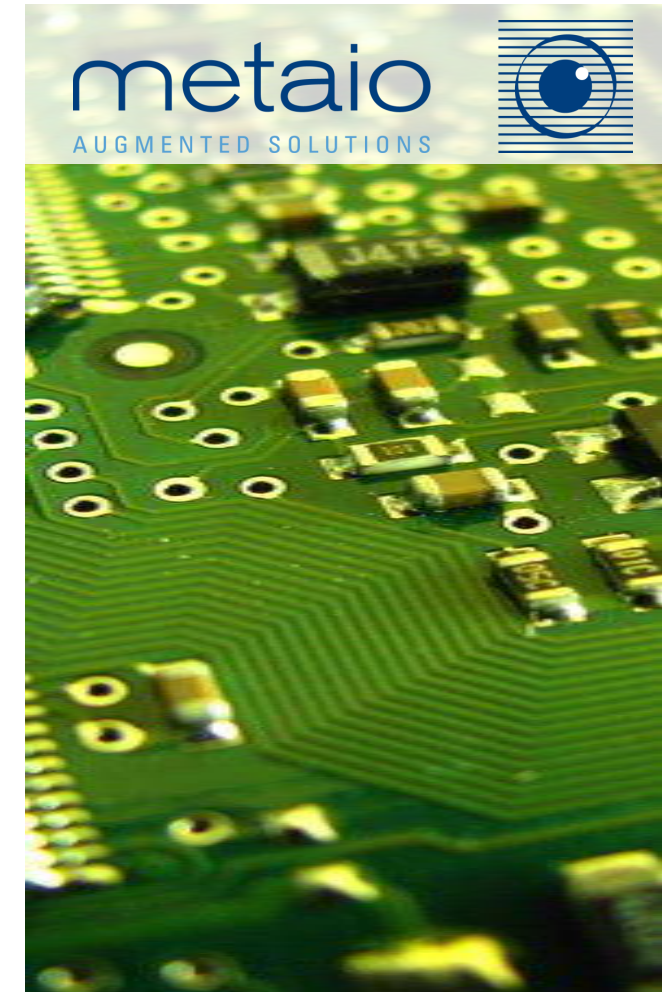
High-level Overview of Mobile SDK

- **Android Developer Perspective**
  - Java IF for straightforward application development
  - Computational-intensive operations in NDK
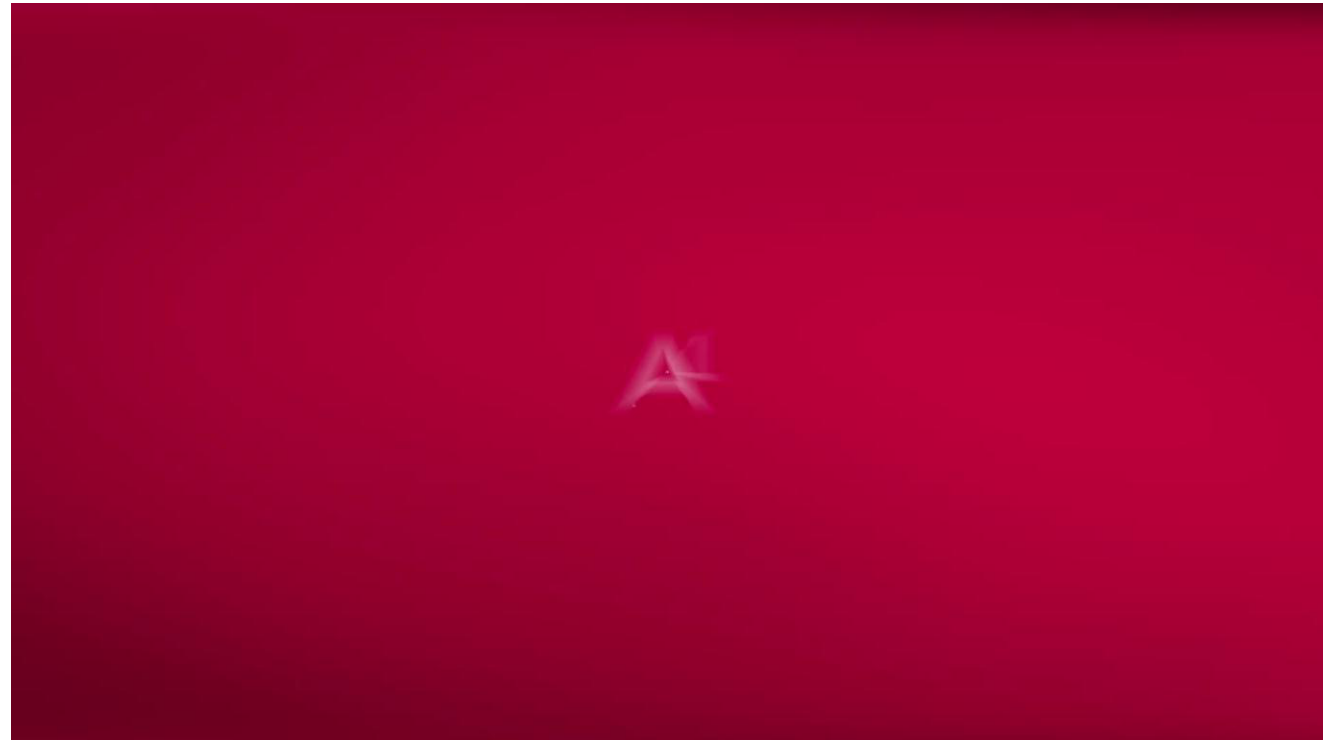 - JNI provides language interoperability
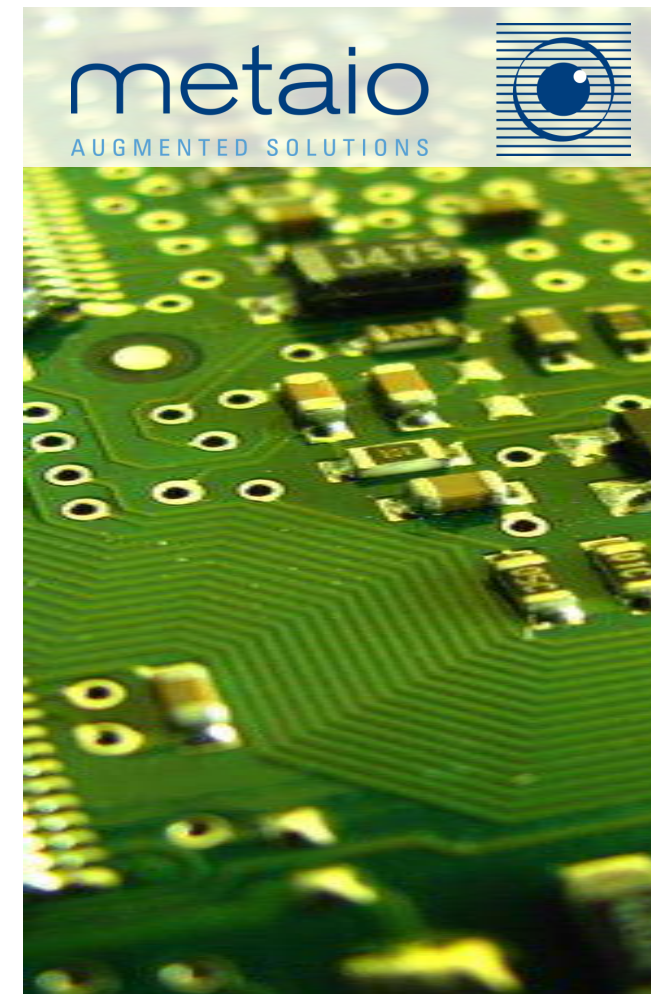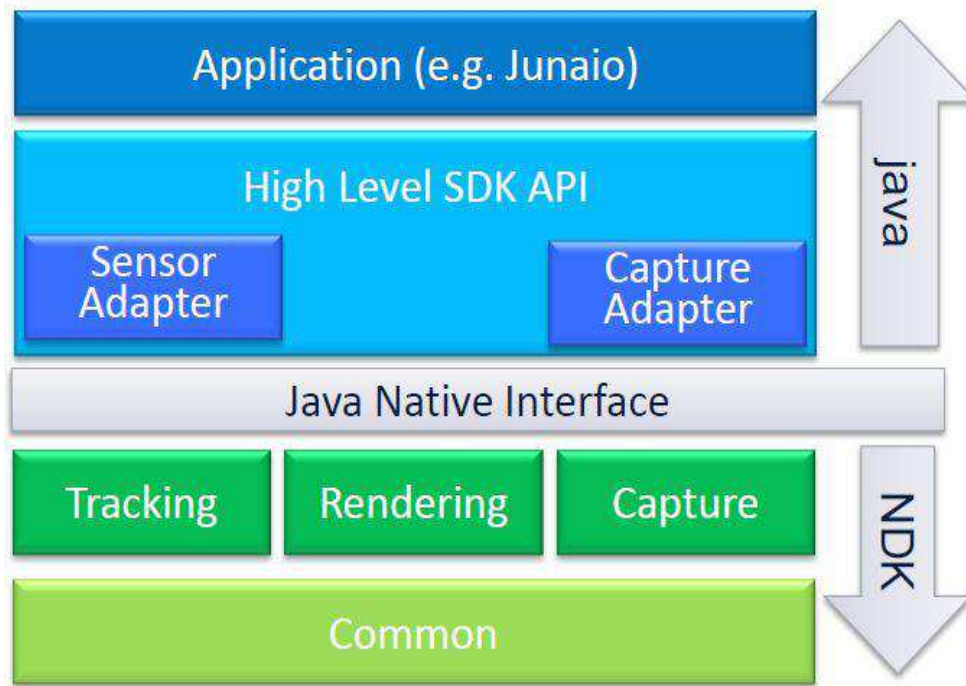
Multiple Object AR

- **More than 40 instances of client-based real-time image detection made possible through specific optimized algorithms**
- **Activation and recognition speed comparable to Quick Response (QR)**

http://www.youtube.com/watch?v=QQ8HNXtl7jQ&feature=player_embedded
http://creativity-online.com/news/mccannerickson-gives-new-ikea-catalog-a-vitamin-pill/236165

Useful AR Optimizations

• **100+ images detected and recognized**
• **Same algorithms and technology are freely available to mobile developer ecosystem**

AR Enhanced Print Media (Mobile AR)

http://www.youtube.com/weltderwunderadsales#p/f/3/KZS1Q3I0a9Q

- Powering "AR-Lite" cloud-based experiences that should be accessible in nearly all connectivity environments

- Current adopters: The Atlantic, Axel Springer, Burda, Süddeutscher Verlag, USA Today

- **+10 million copies of AR enhanced magazines are powered by junaio cloud infrastructure**

API | Hardware Wish List

- **One Computer Vision hardware abstraction layer for Android and iOS**

- **Native/Advanced camera access across different platforms:**
  - Visualization image and tracking image
  - Hardware optimized image pre-computations/conversions
  - Full control of camera parameters such as shutter, brightness, (auto-) focus
  - Very fast texture upload to renderer for camera image
  - Platform independent parallelization approaches (SIMD and multi-core)
  - Hardware implementation for most important AR functions to address the battery consumption issue
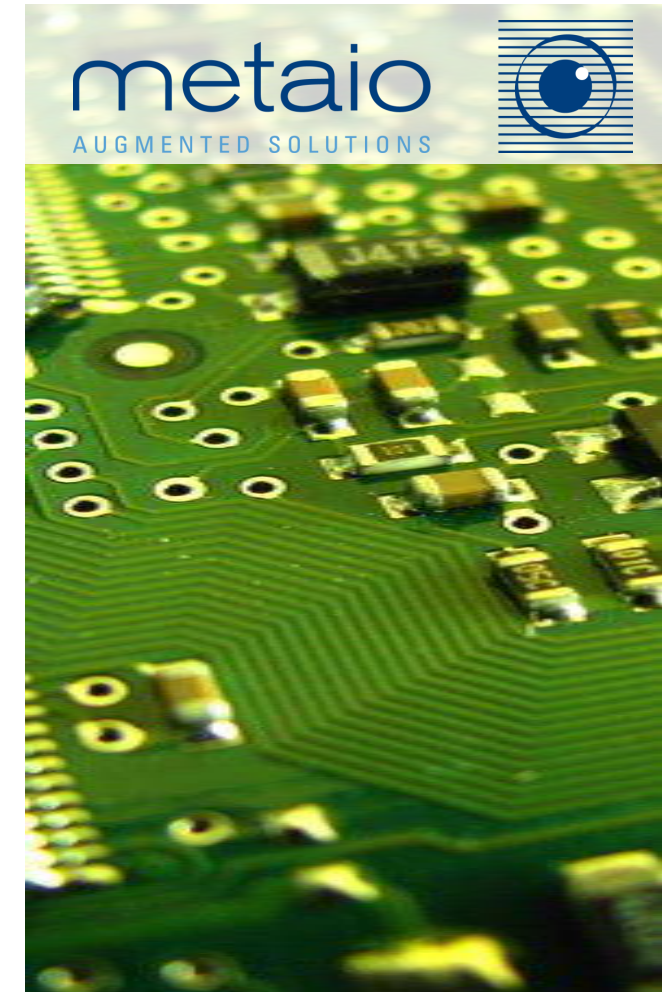
metaio
AUGMENTED SOLUTIONS

www.metaio.com

insideAR
Augmented Reality Conference | 1-2 October, Munich
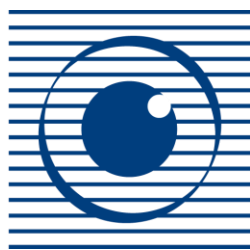
@twitt_AR   facebook.com/metaio   augmentedblog.wordpress.com