

Course at TU Darmstadt
Peter Kretz, april, 20th 2015

TECHNISCHE
UNIVERSITÄT
DARMSTADT





- Study of Physics in Bonn, diploma in Physics
- 1998 – 2006 at MOSAIC Software AG as developer → chief developer → director
- 2006 – 2010 at sd&m (later Capgemini) as business area manager
- Since 2010 business area Travel & Logistics at msg systems ag
 - region manager west, business development Cologne
 - Industry Focus: Logistics
 - Further expansion of the excellent software engineering skills
- Extensive experience in all phases of software development projects, focus on project management and sales
- Part time program Master of Business Administration, specializing in logistics

Privates



*Born in the
Rhineland*



married, 3 children



football (soccer)



last holiday ...



AGENDA

1. Motivation / Overview: „Consumerisation of IT“
2. What are mobile clients?
3. How and where mobile clients are used
4. Architecture for mobile enterprise solutions
5. Prototyping of mobile solutions
6. Literature

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What means consumerization ?



➔ Consumerization describes the change of how new technologies are introduced into the IT environment of a company.

Formerly

- New technologies has been introduced in companies first and later on in the consumer sector.

Nowadays

- New technologies will be introduced in the consumer sector first and later on in companies

Consumerization of business applications:

The use of new technology such as smartphones, tablets, etc. ... for enterprise applications.

This trend plays into our hands. We can use our expertise on consumer products, which are now used in the business IT more frequently.

The popularity of smartphones increases

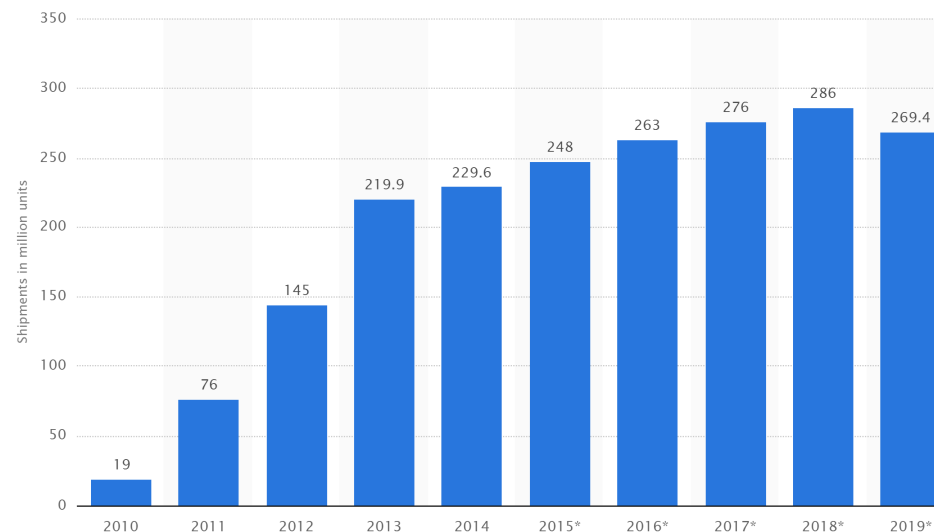


Various factors are responsible for this change :

Increasing number of smartphones and tablets:

The popularity of smartphones within enterprises increases either through official purchases or by employees themselves.

Tablet sales:



Source: © Statista 2015

* estimated

Is it a general trend or just an isolated phenomenon?



That this is a general change, is shown by the fact that companies like SAP pick up the change.

“SAP is so bullish on mobile that, it believes in 5 to 10 years, all interactions with applications will be done through a mobile device.”

Source: Forrester

“SAP today revealed an ambitious plan to release a new mobile development platform based on the spoils of its \$5.8 billion acquisition of Sybase, ...

Source : Search.SAPcom

Hilti-CIO proclaimed the end of the dictatorship IT:
Martin Petry has standardized the IT so far, that satisfaction decreased. Nowadays, there are no strict rules anymore, Hilti supports their employees: “Bring your own IT”.

Source : CIO

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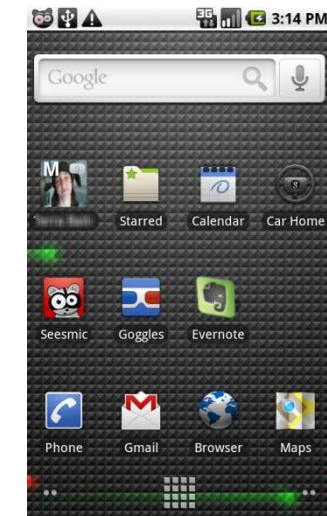
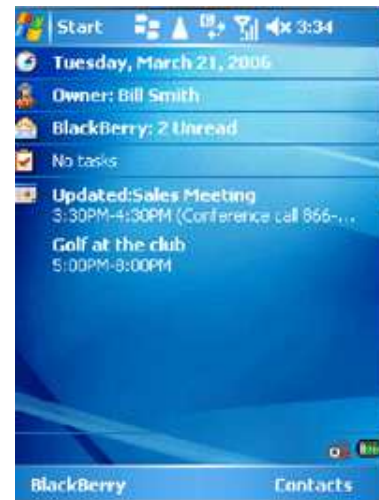
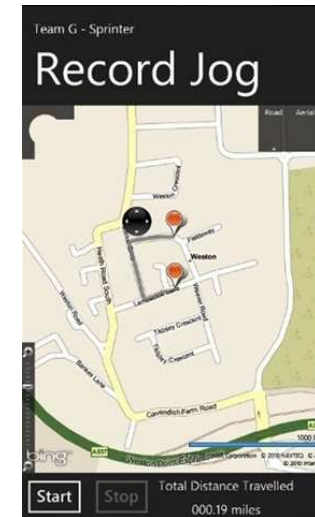
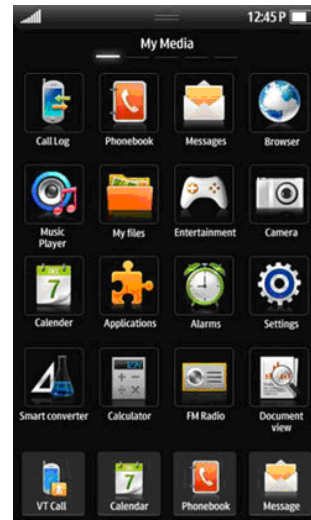
5. Prototyping of mobile solutions

6. Literature

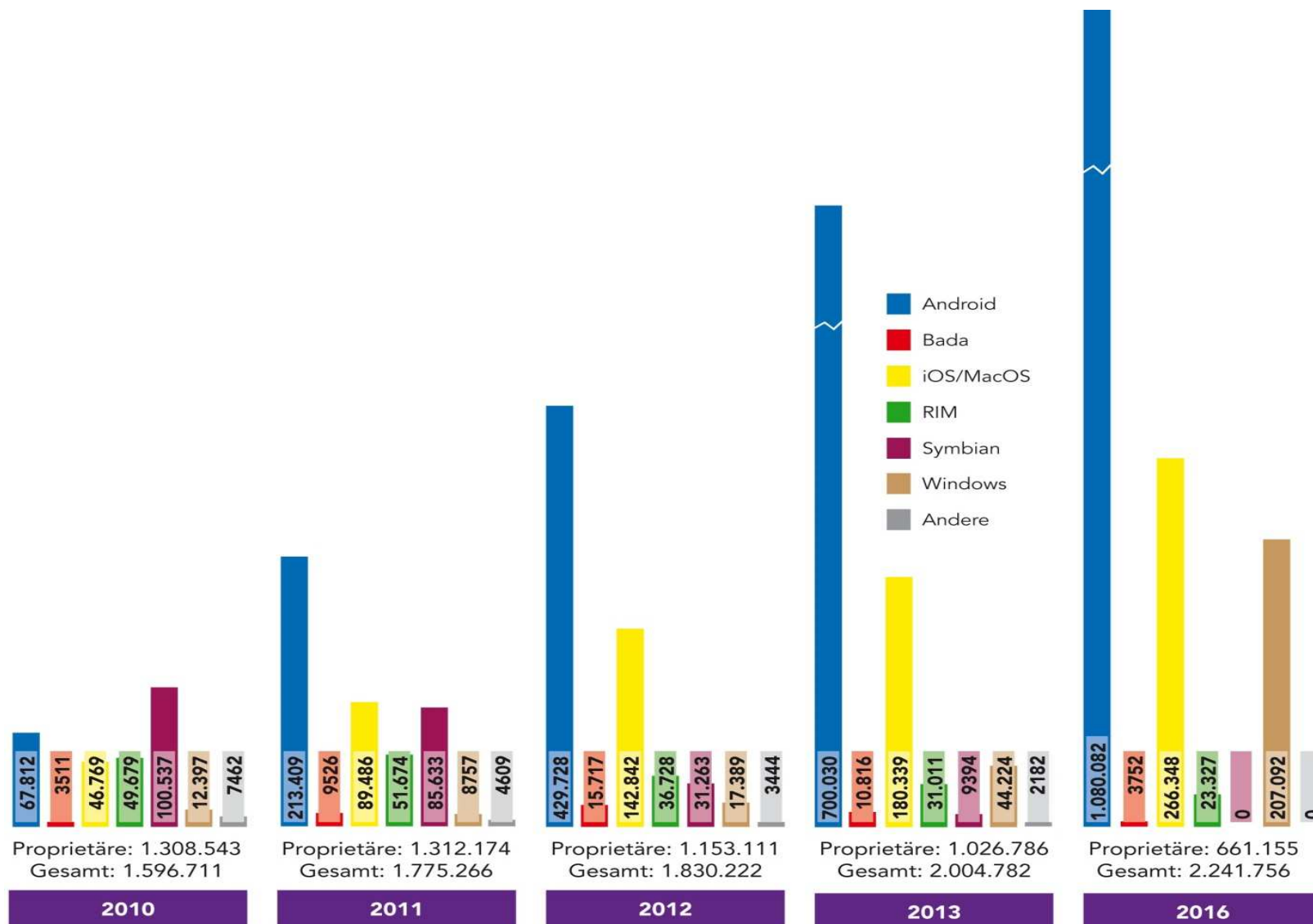
First off all, mobile clients are simply devices ...



... but they are also software.



Gartner's forecast of market shares of mobile OS



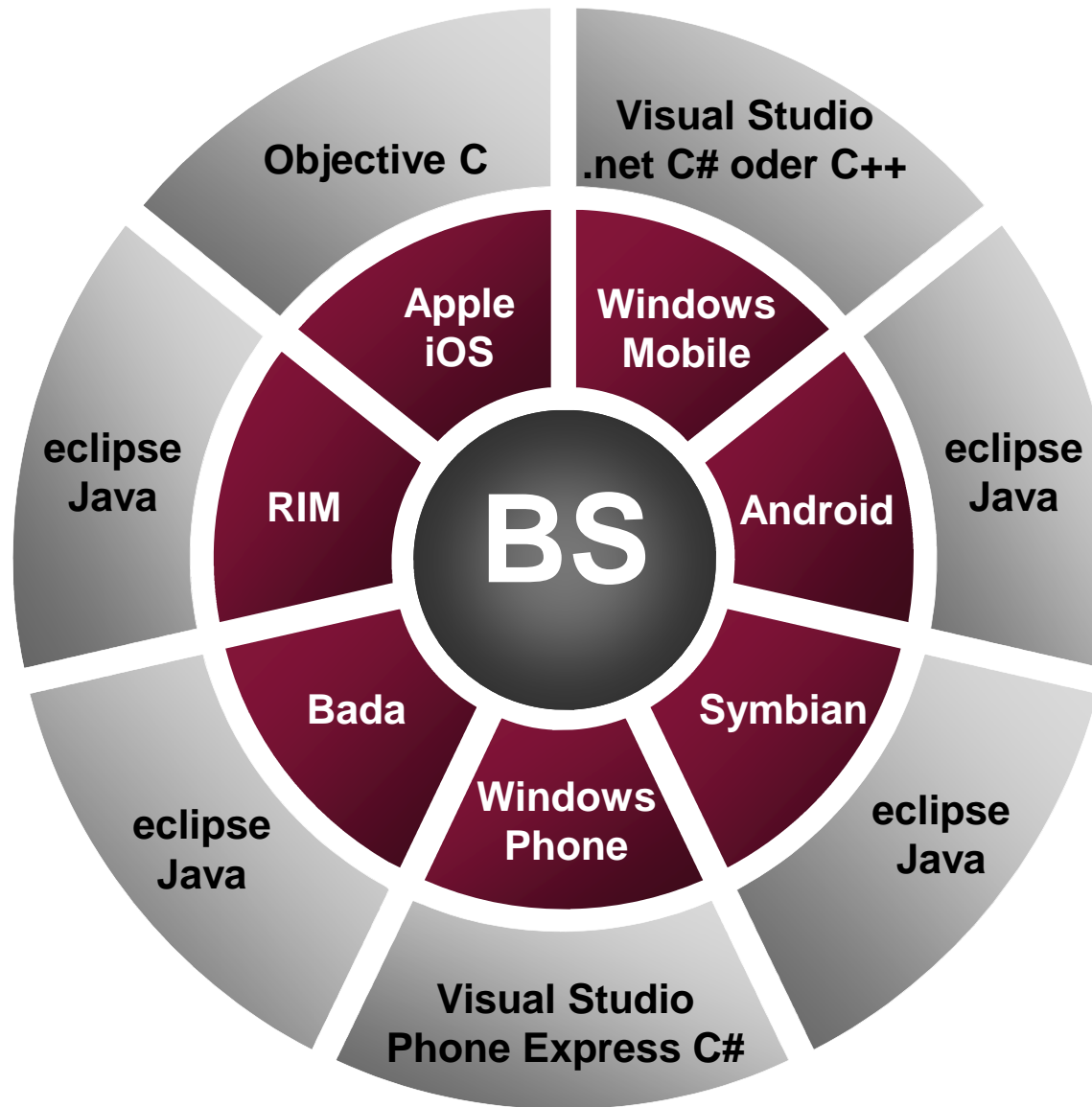
[Gart]

What are the differences between mobile clients?



- Operating system
- Display
- Battery life
- Processor
- RAM and flash memory
- Interfaces for data communication
- Keyboard
- Fall protection
- IP protection class
- Type of data collection
- Dimensions and weight
- Operating temperature
- Pricing

How to develop on different operating systems



Cross Platform Development



Which platform to use?



iOS

Objective-C/Swift

Xcode



Android

Java/C++

Android Studio / Eclipse



Windows

C#/VB/F#

Visual Studio



Why?

- Similar language, IDE, paradigm
- One single code base (single source)
- Savings (time and money)

Which way to choose?



APACHE
CORDOVA™

VS.



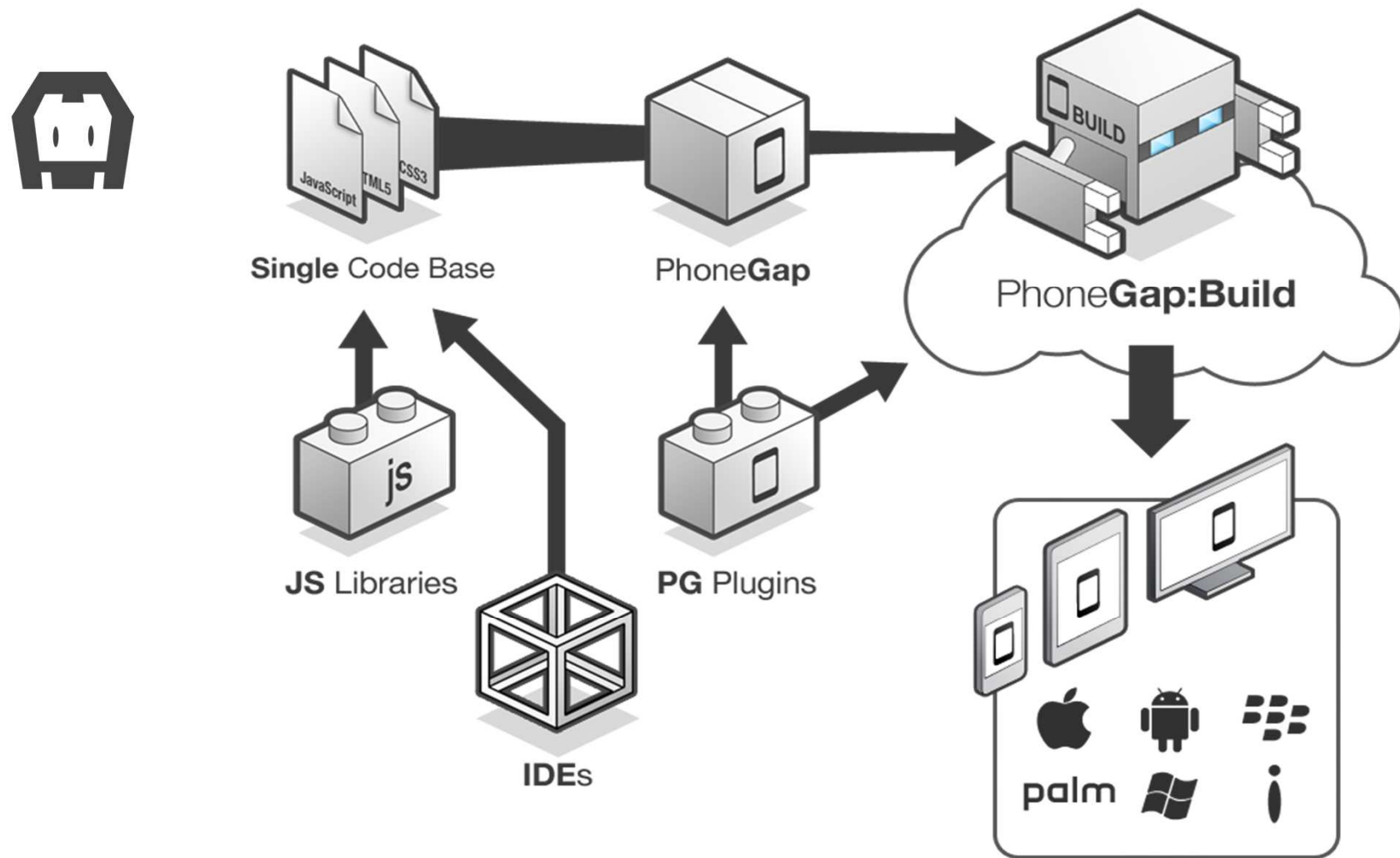
Xamarin



“PhoneGap is a distribution of Apache Cordova. You can think of Apache Cordova as the engine that powers PhoneGap, similar to how WebKit is the engine that powers Chrome or Safari.”

—Brian Eroux, The PhoneGap Team

How PhoneGap works



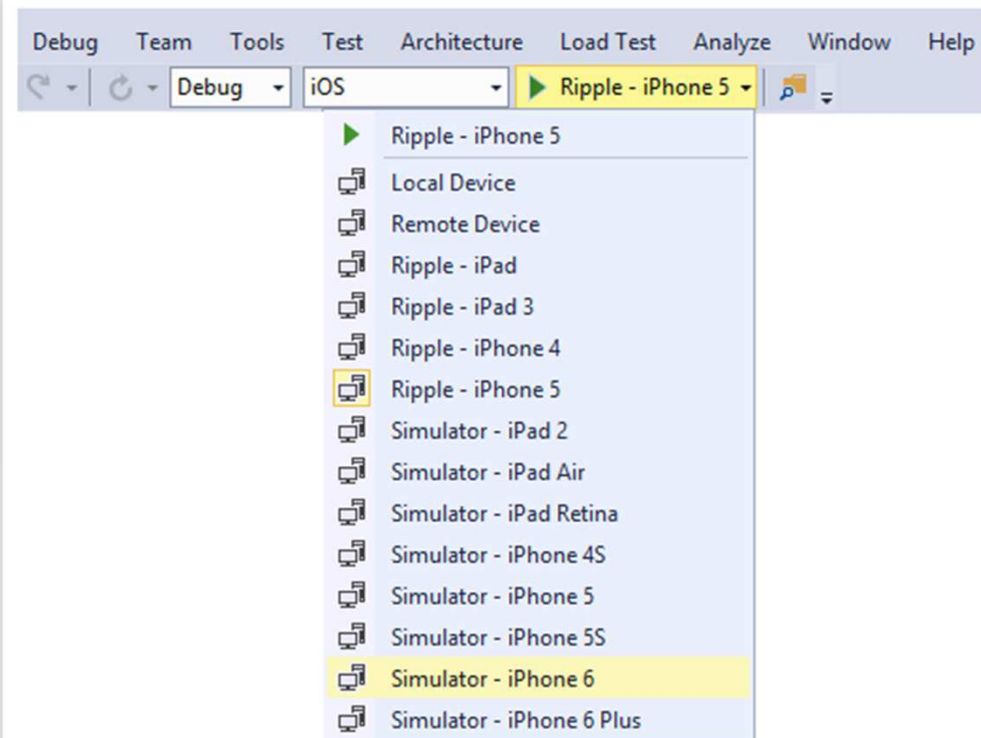
Apache Cordova within Visual Studio



```
script.js X
function getClickPosition(e) {
    var parentPosition = getPosition(e.currentTarget);
    var xPosit = parentPosition.x;
    var yPositio = parentPosition.y;
}

function getPosition(element) {
    var xPosition = 0;
```

Visual Studio
2013



Which features could be used?

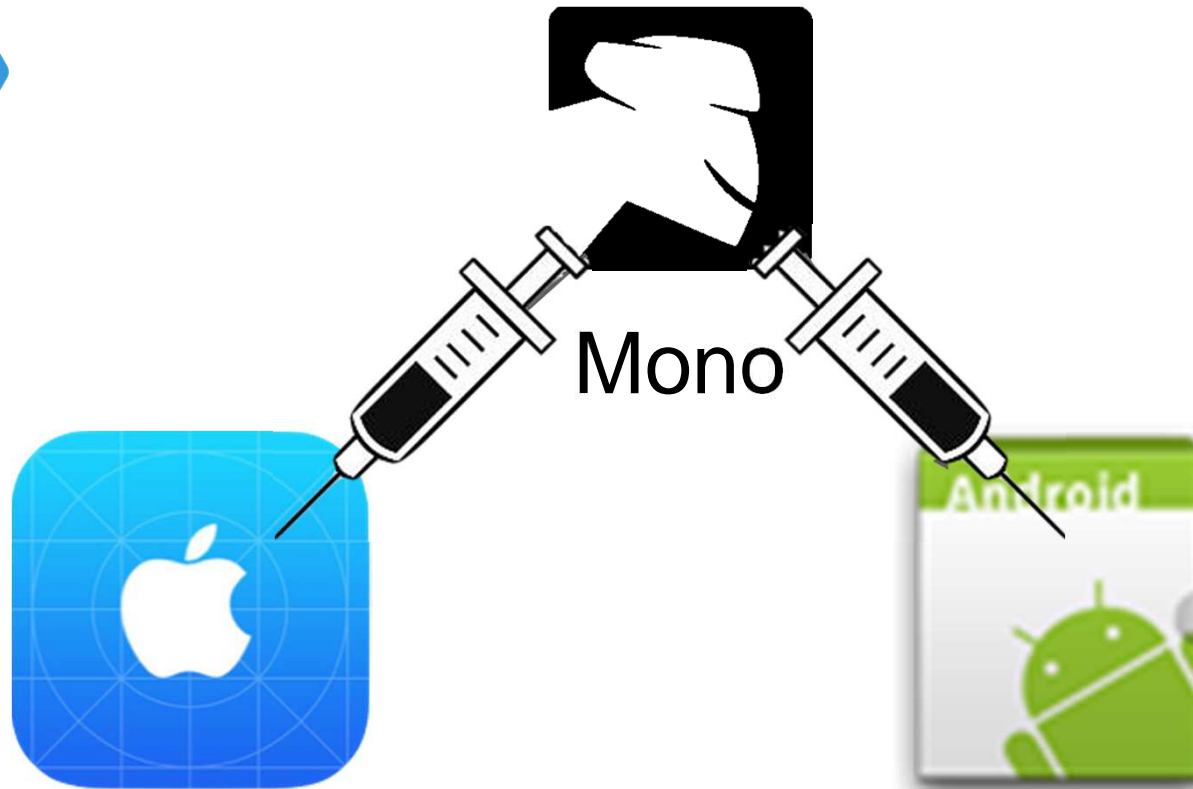


	 iOS iPhone / iPhone 3G	 iOS iPhone 3GS and newer	 Android	 OS 4.6-4.7	 OS 5.x	 OS 6.0+	 WebOS	 WP7	 Symbian	 Bada
ACCELEROMETER	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓
CAMERA	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓
COMPASS	✗	✓	✓	✗	✗	✗	✗	✓	✗	✓
CONTACTS	✓	✓	✓	✗	✓	✓	✗	✓	✓	✓
FILE	✓	✓	✓	✗	✓	✓	✗	✓	✗	✗
GEOLOCATION	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MEDIA	✓	✓	✓	✗	✗	✗	✗	✓	✗	✗
NETWORK	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NOTIFICATION (ALERT)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NOTIFICATION (SOUND)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NOTIFICATION (VIBRATION)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
STORAGE	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗

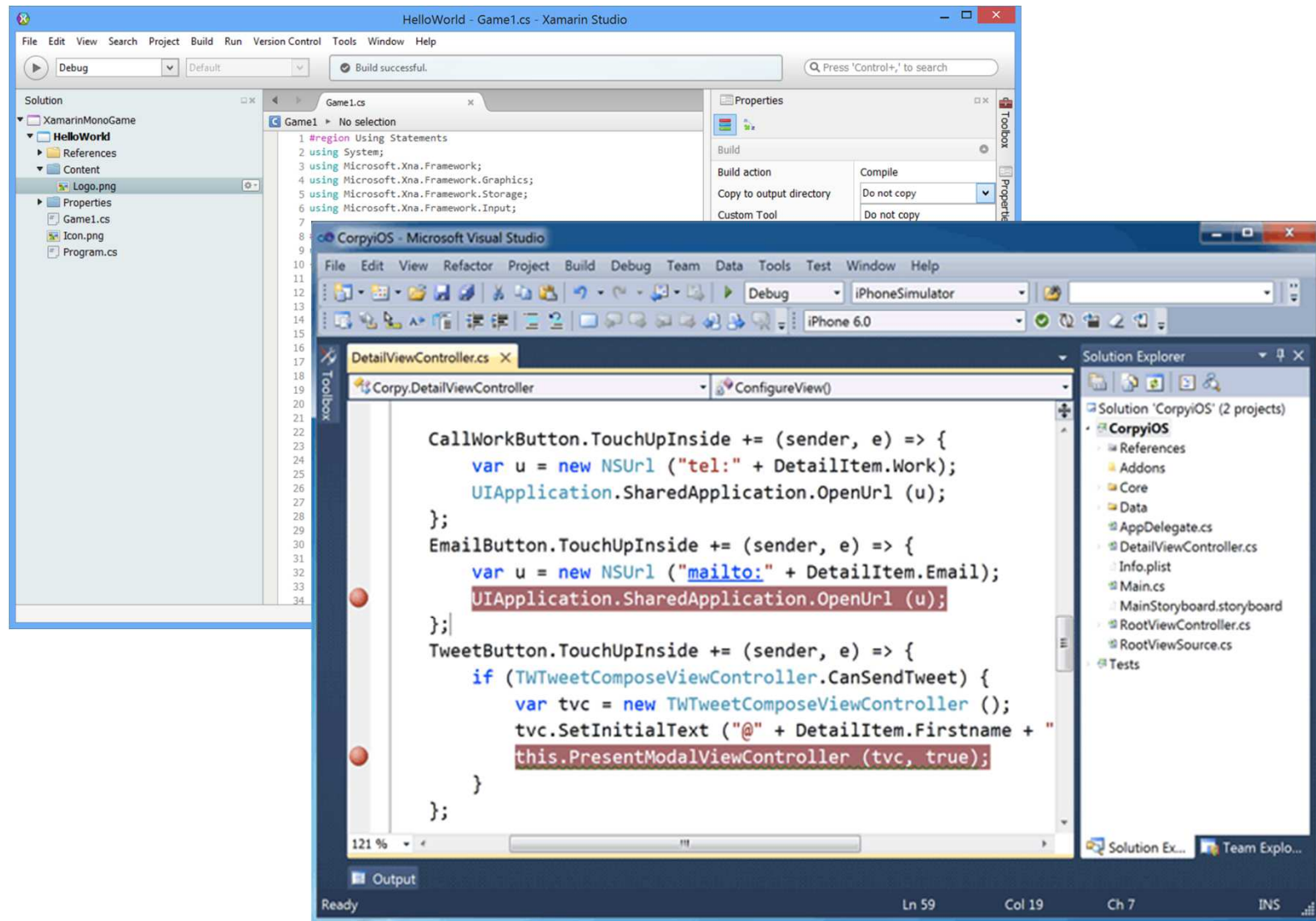
Advantages and disadvantages



- + A lot of supported platforms
- + Nearly only web skills necessary
- Hardware access is slow
- Not all features could be used on some devices
- Risk of exclusion from apple store



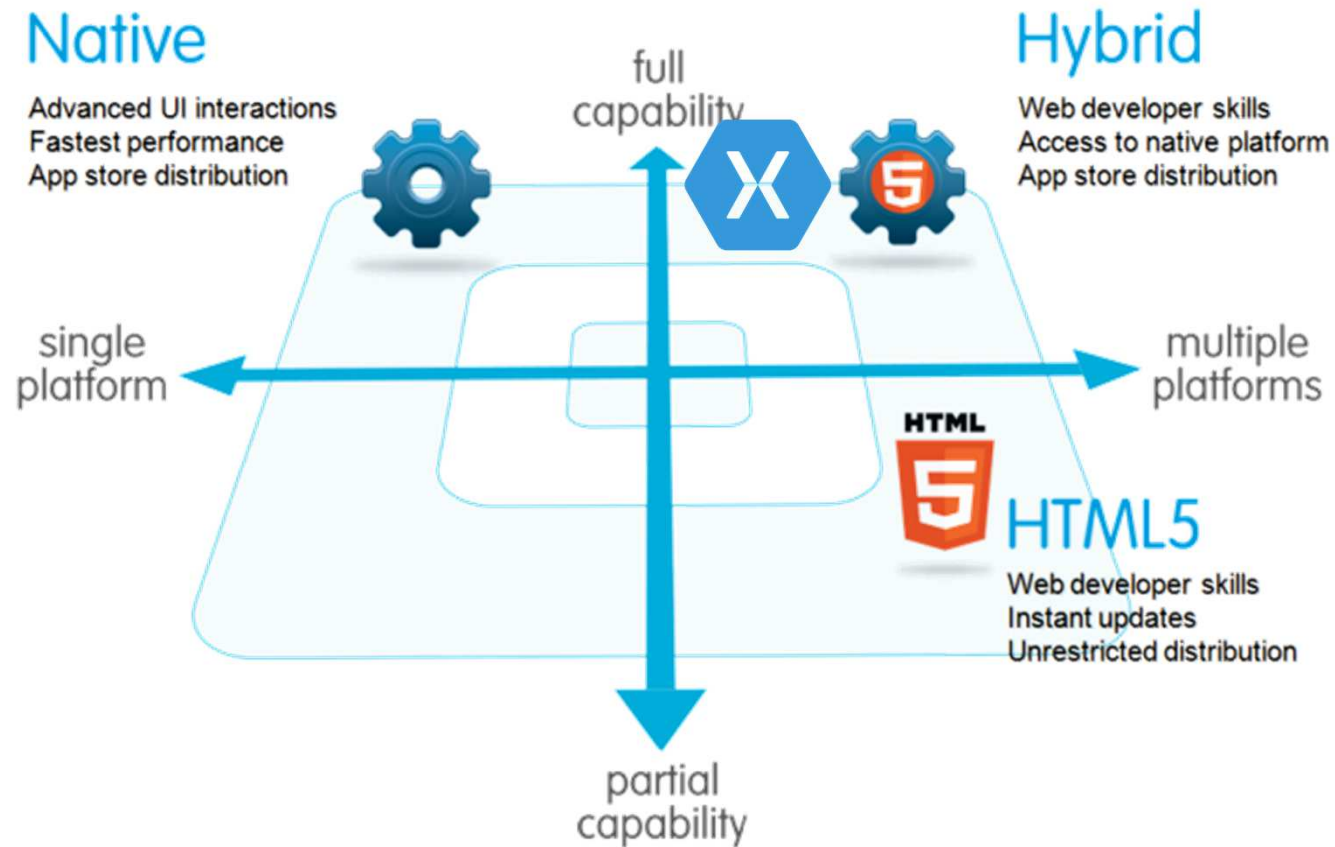
Development with Xamarin





Advantages and disadvantages



- + Native speed and functionality
- + Native UI
- + Up to 100% shared code with Xamarin.Forms
- \$999 / year and developer and platform
- Bigger apps (Mono)
- Still need of knowledge in different OS
- Risk of exclusion from Apple Store



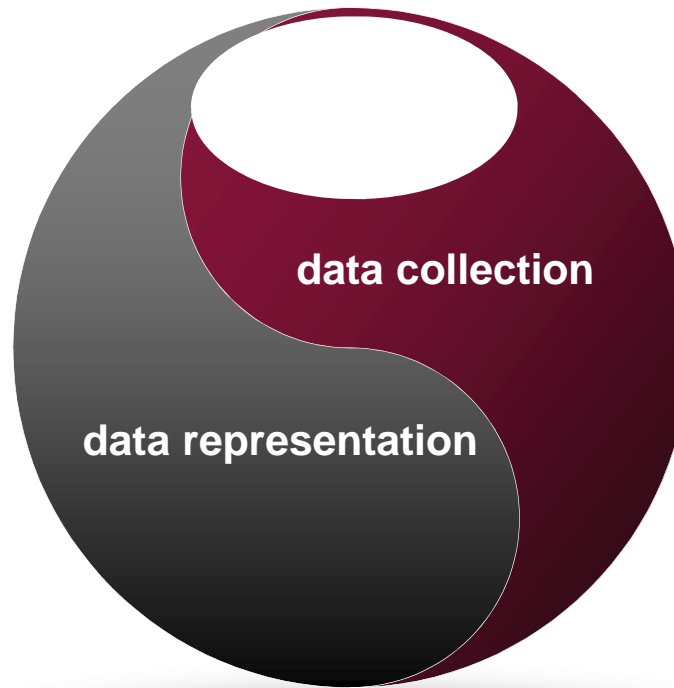
What to choose?

CORDOVA		XAMARIN	
Content-Driven / Design		Performance / function	
Less or no hardware support		Hardware and platform support	
Almost every platform		The most important platforms	
Rapid Prototype / web site as an app		Software development	

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There are two major application areas for mobile devices



Why should one use mobile data collection?



Optimization

Automation

Acceleration

Quality

Optimization of business processes

- No redundant data entry
- No media breaks
- No transmission errors
- Actual data basis
- Increasing efficiency
- Savings

Optimization

Automation

Acceleration

Quality

Automation of downstreamed processes

- Automation of downstreamed processes
- Interface issues must be considered

Why should one use mobile data collection?



Optimization

Automation

Acceleration

Quality

Acceleration of data collection

- Depending on the type of mobile data collection, a significant acceleration is possible
- Quick availability of data
- Overall Process acceleration

Why should one use mobile data collection?



Optimization

Automation

Acceleration

Quality

Higher quality of data

- Plausibility check directly at the site of data generation
- Depending on the detection method, intrinsic testing of data (such as checksums)
- Interactive guidance is possible
- No downstream scanning and OCR processes necessary

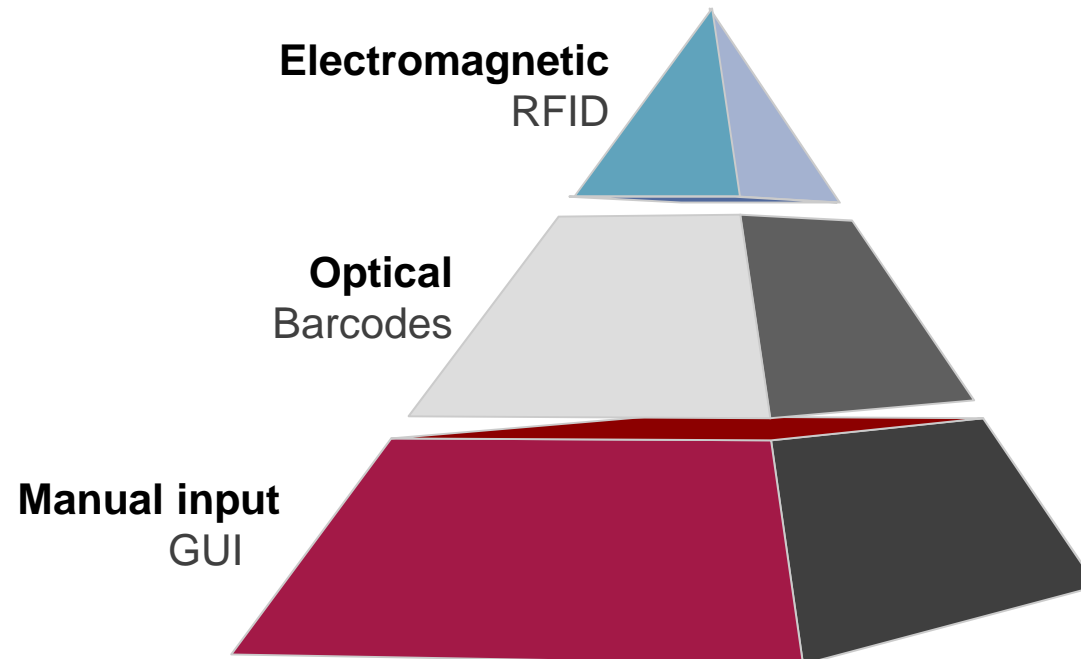
What types of data collection are available?



costs



usability



- **Field service/ service technician / maintenance / protocols**
- **Rescue / ambulance**
- **Fire department / prospecting of fire**
- **Facility management, GIS, Inventory, removals, maintenance, service**
- **Car edition / service / return**
- **dealing field**
- **Hospital / Clinic**
- **Delivery service (parcel services, home delivery service, frozen foods, drinks)**
- **Spare parts management**
- **Enterprise data collection**
- **Checkout**

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Characteristics of business information systems

large and complex

long lifetime

constant change

build to run

Goals of the architecture to take account of the characteristics

- Find manageable sub-structures
- Development with multiple teams
- Development in stages
- Extremely clear
- System must be changable
- Maintainability
- Recognizable solutions
- Uniform, consistent solutions
- Rules, conventions
- Consider infrastructure
- Replacement / upgrade of sub-systems possible (Middleware, hardware, data base)

Software categories: Separation of concerns

Software categories



0-Software

Independent of application and technology;
Ideally **reusable**;

For example, a class library for strings and containers



A-Software

Determined by the **professional application**;
Independent of technique;
Usually the largest part of the system;
For example, "employee", "booking"



T-Software

Independent of the **professional application**;
Expert for a **technical component** - reusable
For example, database access layer



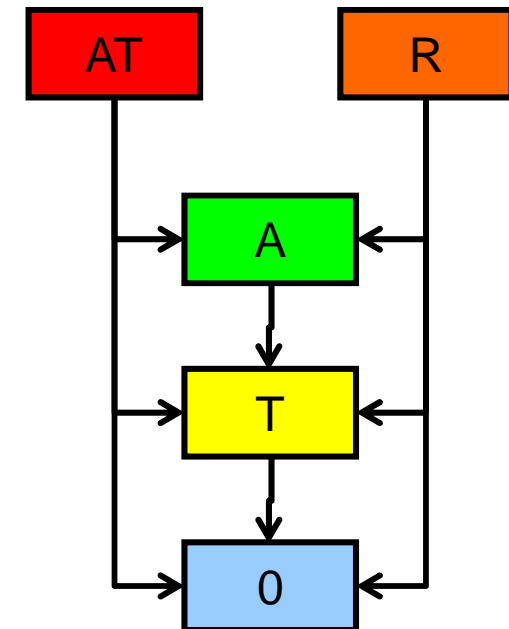
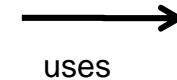
R-Software

Pure transformation (representation);
tolerable mixture of A and T
For example, Implement screen display into XML



AT-Software

Dealing with mixed **techniques and applications**;
Basically to avoid: hard to maintain;
opposes changes;
Reuse nearly impossible!



The component tailoring has to define the responsibilities and to minimize dependencies



Summary component tailoring

Goals

Separation of technical services

Separation of concerns

Parallel development

Encapsulation of neighbour systems

Guidelines

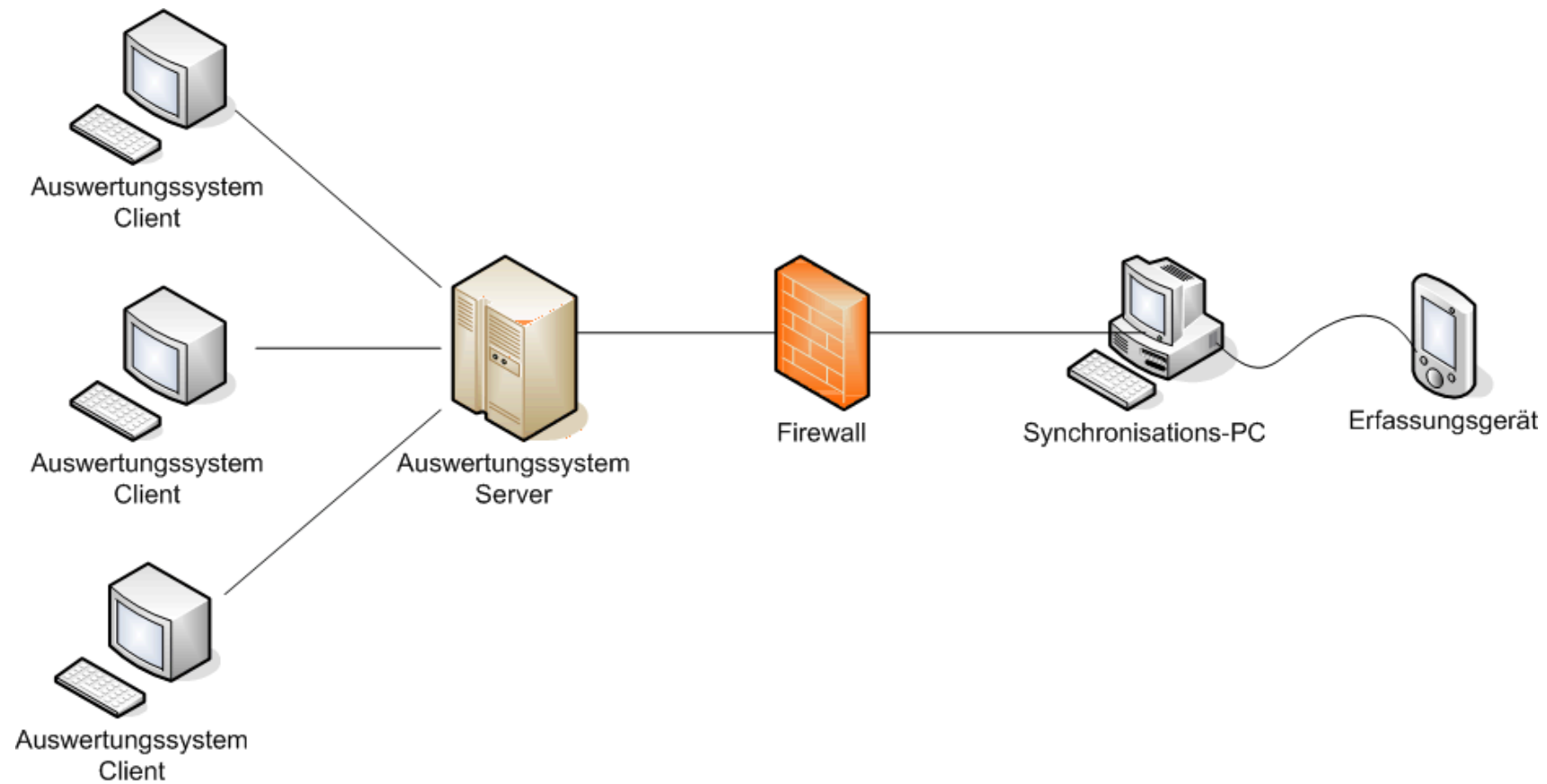
- Separation of application logic (A) and technology (T)
- Application core (A software) is technology independent
- Encapsulate technical dependencies

- More than one concern is bad
- Avoid distributed concerns
- Document concerns (What is the secret of the component?)
- **Components belong to exactly one software category**

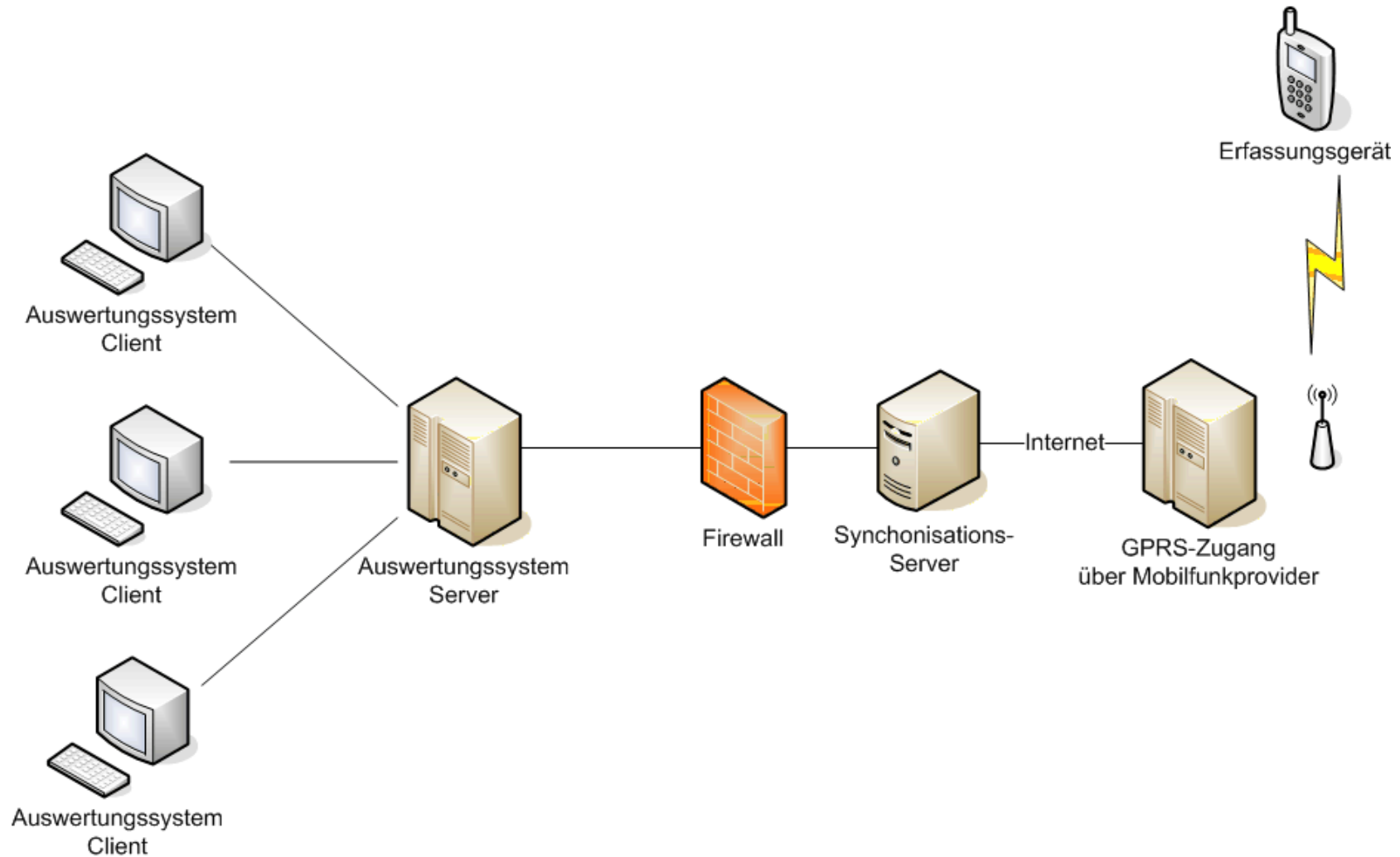
- Tailor components so that they can be developed separately
- Minimize the interfaces between components

- Encapsulate neighbour systems
- Preferably no close coupling

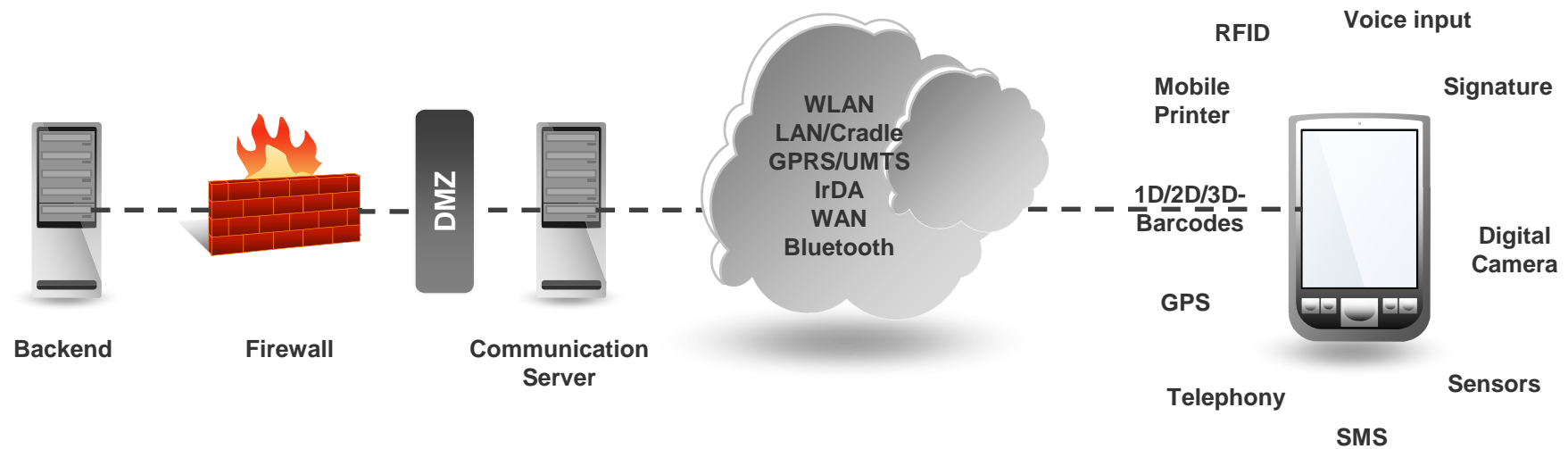
Schematic representation of the wired data transmission



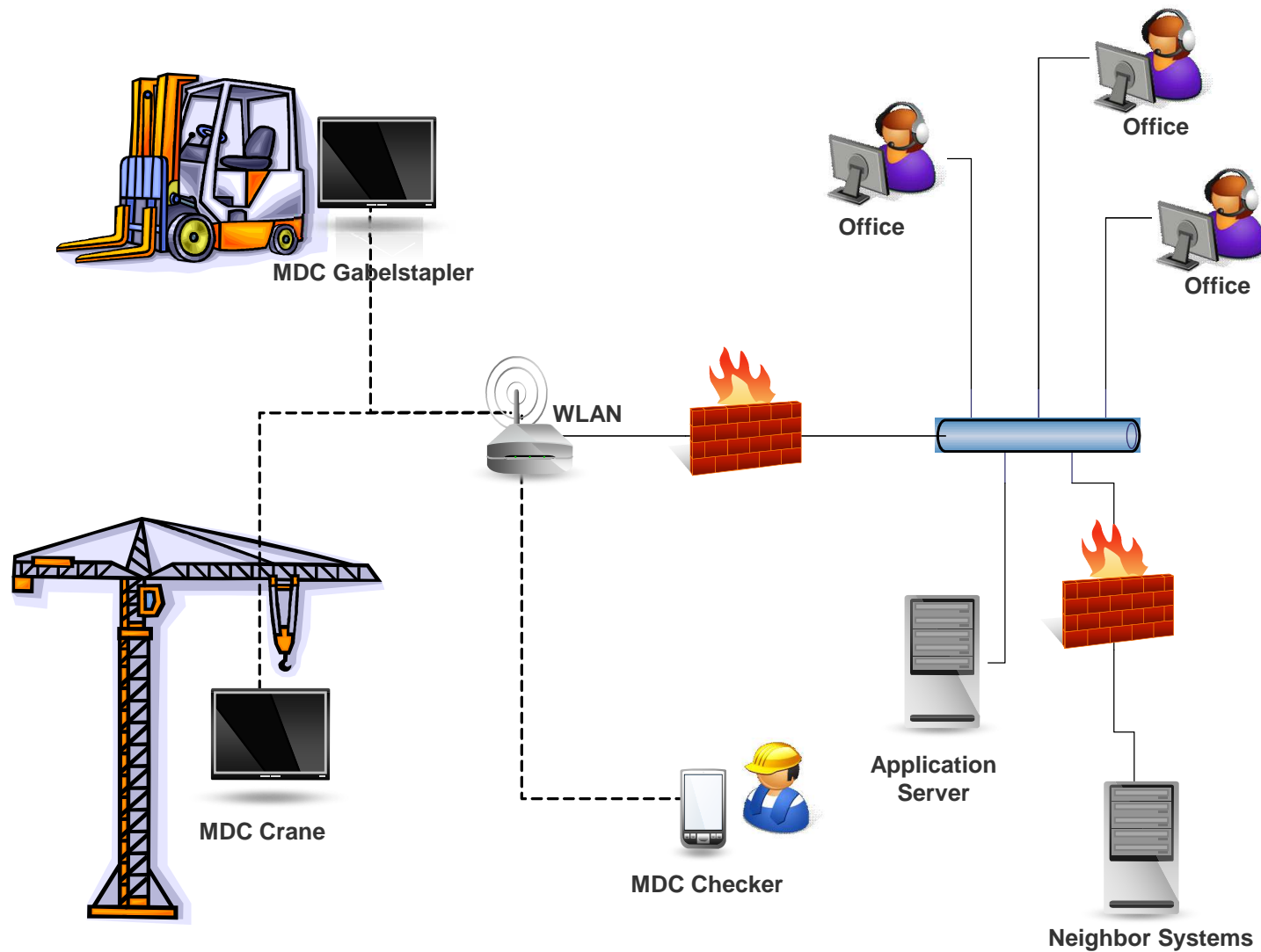
Schematic representation of the wireless data transmission



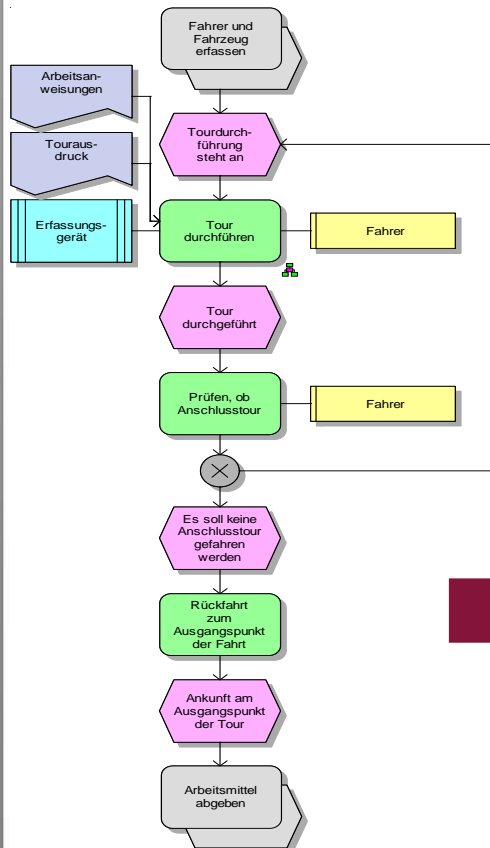
Network architectures of mobile applications



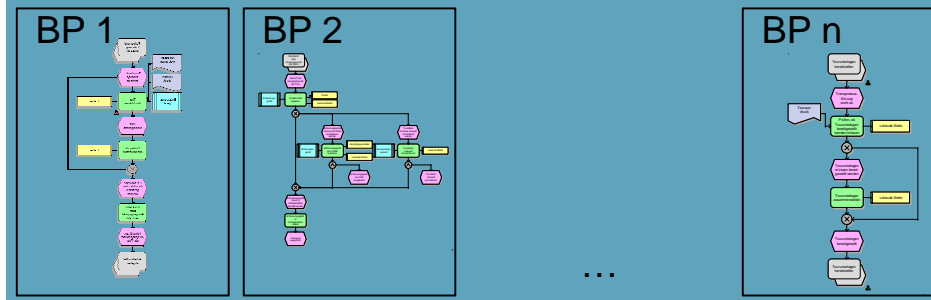
Network architectures of complex mobile applications



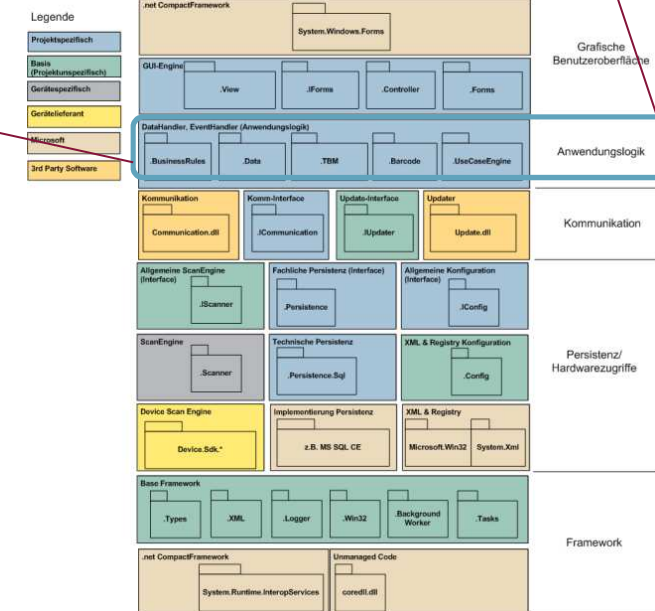
Business Process (BP)



Business Logic



Business Logic



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User Interface Prototyping



Important!

- Quick, easy, cheap
- easily changeable



and also a good idea ...

- Installing ad hoc changes (in the meeting)
- Executable, interactive (workflow, data entering)

Prototypes in mobile environment

Usability challenges

- Small Screen
- No wholesome keyboard
- Different operating concept (e.g., right click)
- Perhaps other style guides
- On the way (in the car, noises, sun)
- Intuitive

Possibilities

- Gesture control
- Screen orientation
- Position sensors
- Accelerometers
- Compass
- Location based services
- Camera
- NFC (near field communication)



Examples for gesture control



CORE GESTURES Basic gestures for most touch commands

Tap



Briefly touch surface with fingertip

Double tap



Rapidly touch surface twice with fingertip

Drag



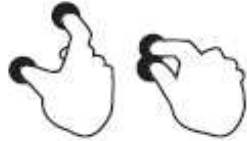
Move fingertip over surface without losing contact

Flick



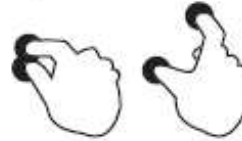
Quickly brush surface with fingertip

Pinch



Touch surface with two fingers and bring them closer together

Spread



Touch surface with two fingers and move them apart

Press



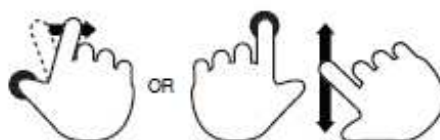
Touch surface for extended period of time

Press and tap



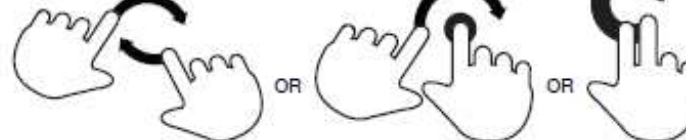
Press surface with one finger and briefly touch surface with second finger

Press and drag



Press surface with one finger and move second finger over surface without losing contact

Rotate



Touch surface with two fingers and move them in a clockwise or counterclockwise direction

Prototyping tools



What are prototyping tools able to achieve?

- Development in team
- Selection of ready-made templates
- Interactive operability of the prototype

And what not?

- They do not replace a concept or a design
- No technological stick through
- No source code → **Discard it!!!**



- Balsamiq Mockups
- Axure RP
- Expression Blend SketchFlow
- Fluid UI
- Pencil
- ...



balsamiq

- Easy to learn
- Intuitive and fast creation of layouts
- Scribble look
- Export as picture, pdf, ...
- platform independent -> Adobe AIR
- not suitable for click-dummies

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- harder to learn
- More features
- Interactive usage of prototypes
- Multi user – team work possible
- Scribble look up to shining look
- Export of a html prototype possible

im Einsatz bei HRS



Licencing



Licences	Pricing
Single User	\$79/ ~60€
Vol. Pack: 2 U.	\$158/ ~121€
Vol. Pack: 10 U.	\$709/ ~542€
Vol. Pack: 25 U.	\$1.599/ ~1.223€



Further information: <http://www.balsamiq.com/buy>

Licences	Pricing up to 4 users per user	Pricing from 5 users per user
Standard	\$289/ ~221€	\$269/ ~206€
Pro: Shared Projects for Team	\$589/ ~450€	\$539/ ~412€



Further information: <http://www.axure.com/buy>

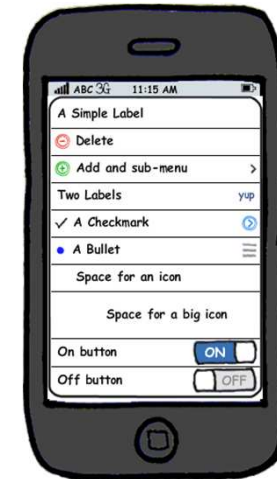
Paper or software?



- Quick and intuitive
- Existing knowledge
- No restrictions
- Collaborative
- Dynamic addition by post-it
- Stencils



msg

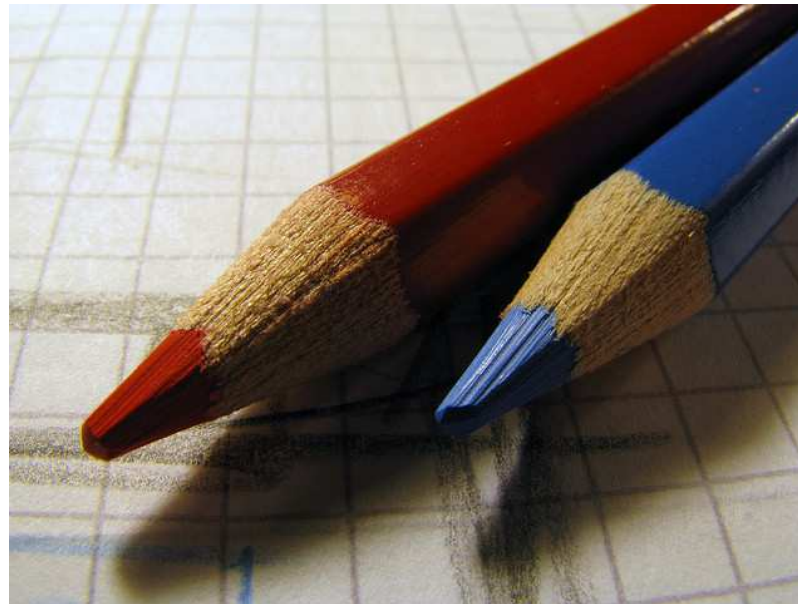


- Construction kit
- Reusing items by copy & paste
- Digitized
- Could be e-mailed
- Desktopsharing
- Klick-dummy

- Implementation in target technology
- All the capabilities of the device
- Live demonstration
- ... but expensive and sloooow
- and architecture trap



Analog prototyping



- Only writing materials required
- Easy to learn
- Changeable everytime without further equipment
- Stencils and templates for standard elements
- Collaboration and team work with pinboard, whiteboard, ...



Paper-Mockup GB-Workshop.mp4



To create a storyboard is more than ...



... only gather requirements

At least: understanding the requirements by **watching closely the users**

Even better: challenge the **behaviour if the user** (asks every time „Why?“)

Ideally: taking the role of the user and **walk through the use cases** yourself

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- [AIM07] <http://www.aimglobal.org/aimstore/matrixsymbolologies.asp#Data%20Matrix>, Zugriff am 22.07.2007
- [Anv10] Anvaari, Mohsen; Architectural Support for Openness in Mobile Software Platforms; University of Gothenburg; Master Thesis
- [Arn02] Arnold, Dieter; Isermann, Heinz; Kuhn, Axel; Tempelmeier, Horst (Hrsg.): Handbuch der Logistik. Berlin, Heidelberg: Springer-Verlag, 2002
- [Ber00] Bergmann, Fridhelm; Gerhardt, Hans-Joachim (Hrsg.): Handbuch der Telekommunikation. München, Wien: Carl Hanser Verlag, 2000
- [Bje97] Bjelicic, B: Hub-Spoke-System. In: Bloch, J.; hde, G. (Hrsg.): Vahlens Großes Logistiklexikon. München: Vahlen, 1997
- [BSI04] Risiken und Chancen des Einsatzes von RFID-Systemen. Trends und Entwicklungen in Technologien, Anwendungen und Sicherheit. Bonn, Ingelheim: Bundesamt für Sicherheit in der Informationstechnik – BSI, SecuMedia Verlags-GmbH, 2004
- [Buc98] Buchholz, Jonas; Clausen, Uwe; Vastag, Alex (Hrsg.): Handbuch der Verkehrslogistik. Berlin, Heidelberg: Springer-Verlag, 1998
- [Dat04] Datalogic Communication Division: Strichcode-Fibel. Erkenbrechtsweiler: Datalogic GmbH, 2004
- [DB07] Die Bahn: Online-Ticket – der bequemste Weg zur Fahrkarte.
- [DPW07] Deutsche Post World Net: Elektronische Tinte statt Papierlabel. DRFID – das Display inklusive. http://www.dpwn.de/dpwn?skin=hi&check=yes&lang=de_DE&xmlFile=2006765 Zugriff am 21.07.2007
- [Fra95] Fraunhofer Institut für Materialfluss und Logistik, Abteilung Verkehrslogistik: AIF Forschungsprojekt Speditionsleitstand. Dortmund: Fraunhofer-Institut für Materialfluss und Logistik, 1995
- [Fuh00] Fuhrmann, Woldemar; Brass, Volker: 11 Mobilfunk. In: Bergmann, Fridhelm; Gerhardt, Hans-Joachim (Hrsg.): Handbuch der Telekommunikation. München, Wien: Carl Hanser Verlag, 2000

- [Gil07] Gillert, Frank; Hansen, Wolf-Rüdiger: RFID für die Optimierung von Geschäftsprozessen. Prozess-Strukturen, IT-Architekturen, RFID-Infrastruktur. München, Wien: Carl Hanser Verlag, 2007
- [Hei07] Heise Verlag: 3GSM: Windows Mobile 6 offiziell vorgestellt. <http://www.heise.de/newsticker/meldung/85158> Zugriff am 07.07.2007
- IDentifikation 2004. Logistiktrends für Industrie und Handel. Eine Studie der Fraunhofer AutoLog Initiative. Dortmund: Fraunhofer-Institut für Materialfluss und Logistik, 2004
- [Hom06] Hompel, Michael ten; Heidenblut, Volker: Taschenlexikon Logistik. Abkürzungen, Definitionen und Erläuterung der wichtigsten Begriffe aus Materialfluss und Logistik. Berlin, Heidelberg: Springer-Verlag, 2006
- [Ins07] insidePDA.de: <http://www.insidepda.de/blog/pda-software-news/screenshot-vom-windows-mobile-5-nachfolger-crossbow/> Zugriff am 07.07.2007
- [Jun02] Jung, Volker; Warnecke, Hans-Jürgen (Hrsg.): Handbuch für die Telekommunikation. 2., überarbeitete Neuauflage, Berlin, Heidelberg, New York: Springer-Verlag, 2002
- [Lob02] Lobensommer, Hans: 5.7 Dienste für die Mobilkommunikation. In: Jung, Volker; Warnecke, Hans-Jürgen (Hrsg.): Handbuch für die Telekommunikation. 2., überarbeitete Neuauflage, Berlin, Heidelberg, New York: Springer-Verlag, 2002
- [Mic07] Microsoft Corporation: Windows CE Home Page. <http://msdn2.microsoft.com/en-us/embedded/aa731407.aspx> Zugriff am 07.07.2007
- [Mot07] Motorola: Technical Information. MOTOROLA G24 DEVELOPER'S GUIDE. AT Commands Reference Manual. Motorola Inc., May 31, 2007
- [Pan05] Panther, Robert: Programmieren mit dem .NET Compact Framework. Pocket PC – Smartphone – Handheld. Pöng: Franzis Verlag GmbH, 2005

- [Ros02] Rosenkranz, Friedrich: Geschäftsprozesse. Modell- und computergestützte Planung. Berlin, Heidelberg: Springer-Verlag, 2002
- [Sal05] Salvatori, Peter: Anwendungsentwicklung für den Pocket-PC. Düsseldorf: DATA BECKER GmbH & Co. KG, 2005
- [Sch98] Scheer, August-Wilhelm: Wirtschaftsinformatik. Referenzmodelle für industrielle Geschäftsprozesse. 2. durchgesehene Aufl., Berlin, Heidelberg: Springer-Verlag, 1998
- [Sie02] Siegmund, Gerd: Technik der Netze. 5., völlig neu bearbeitete und erweiterte Aufl., Heidelberg: Hüthig GmbH & Co. KG, 2002
- [Sie04] Siedersleben, Johannes: Moderne Softwarearchitektur. Umsichtig planen, robust bauen mit Quasar. Heidelberg: dpunkt.Verlag GmbH, 2004
- [Str91] Straube, F.; Kern, A.: Logistische Einsatzmöglichkeiten von Identifikationssystemen in der Transportsteuerung, in CIM-Praxis, Heft 4

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Peter Kretz

GB Travel & Logistics
Max-Planck-Straße 40
50354 Hürth
Telefon: +49 2233 9721 6318
peter.kretz@msg-systems.com

www.msg-systems.com



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