



# How to implement large applications successfully in .NET

## Experiences at sd&m

Harald Haller  
.NET Technologies'2004, Plzen  
June 2, 2004

# Agenda

## n **Introducing sd&m**

Our Projects

Why .NET?

Development Environment

Design

Going Live

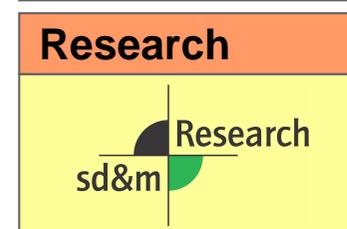
Lessons Learned

# sd&m AG – software design & management

Area of business	
n	Development and integration of tailored information systems for business critical processes
n	IT consulting with engineering and implementation competence
Customers	
n	Major companies and organizations achieving a competitive edge by implementing custom solutions
Core competence	
n	Software engineering and project management



Key facts 2003	
n	Staff: 877
n	Revenue: € 119 million



# Agenda

Introducing sd&m

n **Our Projects**

Why .NET?

Development Environment

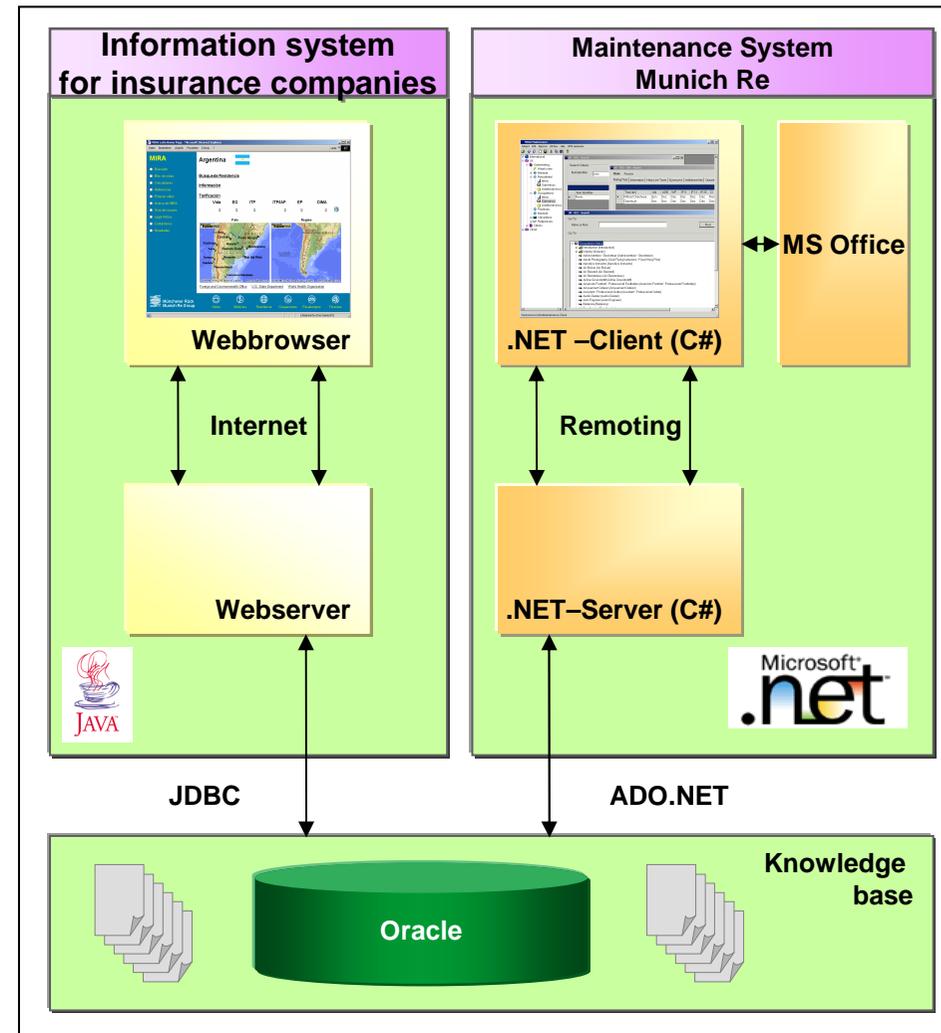
Design

Going Live

Lessons Learned

# MIRA (Munich Re Internet Risk Assessor) is an international application based on both .NET and J2EE

- n Client:  
Munich Re
- n Project:  
Risk Assessor for personal insurance
- n Used by insurance companies worldwide in order to calculate premium depending on medical condition, residence, occupation, and pastimes
- n Key requirements
  - Internationalization
  - Workflow support
  - Document management
  - Office integration





# MIRA is winner of the Microsoft .NET Server Innovation Cup 2003 (Category „Finance“)

The screenshot displays the MIRA Maintenance application interface. The main window is titled "MIRA Maintenance - [International - Occupations - Edit - Dentist]". It features a tree view on the left showing a hierarchy of categories: In work, Market Versions, International, General items, Underwriting, What's New, Medical, Residential, Occupations, Items, Submenus, Additional docs, Allowed Rates, Shortcut texts, Pastimes, Financial, Calculators, References, About MIRA, and Claims. The "Dentist" item is selected, and its details are shown in a table with columns: Tree, Life, CI, ADB, TPD own, TPD any, WF, IP 4, IP 13, IP 26. The table shows data for "Age < 45 yrs" and "Age 45 yrs and above".

A secondary window titled "MIRA Maintenance - [UK - Residential - Edit - Russia]" is open, showing the "Item" details for "Russia". The "Help Texts" section contains "DANGER" and "TEMPORARY". The "Preview" section shows a table of dangerous regions in Russia:

Region	Security risks
<ul style="list-style-type: none"> <li>the Chechen Republic,</li> <li>Ingushetia,</li> </ul>	High
<ul style="list-style-type: none"> <li>Dagestan and North Ossetia,</li> <li>Karachai-Cherkessia,</li> </ul>	Considerable
<ul style="list-style-type: none"> <li>Kabardino-Balkaria (including the Elbrus area)</li> <li>and to eastern and southern parts of Stavropol Krai, particularly where it borders Chechnya and North Ossetia.</li> </ul>	Moderate

At the bottom of the interface, a status bar indicates "Operation successfully terminated." and "Welcome to MiraMaintenance Client".

## We started to implement .NET applications with beta versions of the .NET framework

Client	Project	Technologies
Real I.S.	Core Application for real estate investment	C#, Windows.Forms, ADO.NET, Remoting
Investment company concerning pension plans	Internet portal	VB.NET, ASP.NET, COM+, ADO.NET
Hugo Boss	Management System for products needed to design and produce collections	C#, Windows.Forms, PlatformInvoke
Munich Re	several	C#, ASP.NET, ADO.NET
...	...	...

# Agenda

Introducing sd&m

Our Projects

n **Why .NET?**

Development Environment

Design

Going Live

Lessons Learned

## With .NET Microsoft provides an innovative development platform

### Reasons for clients to choose .NET

- n .NET is the Microsoft platform for software development
- n Excellent integration of .NET with Microsoft products
- n Designers of C# learnt from Java and C++
- n C# is state of the art
- n Software development environment (Visual Studio .NET) makes the development easier and faster
- n ...



,NET is the platform of choice in a Microsoft environment

# Agenda

Introducing sd&m

Our Projects

Why .NET?

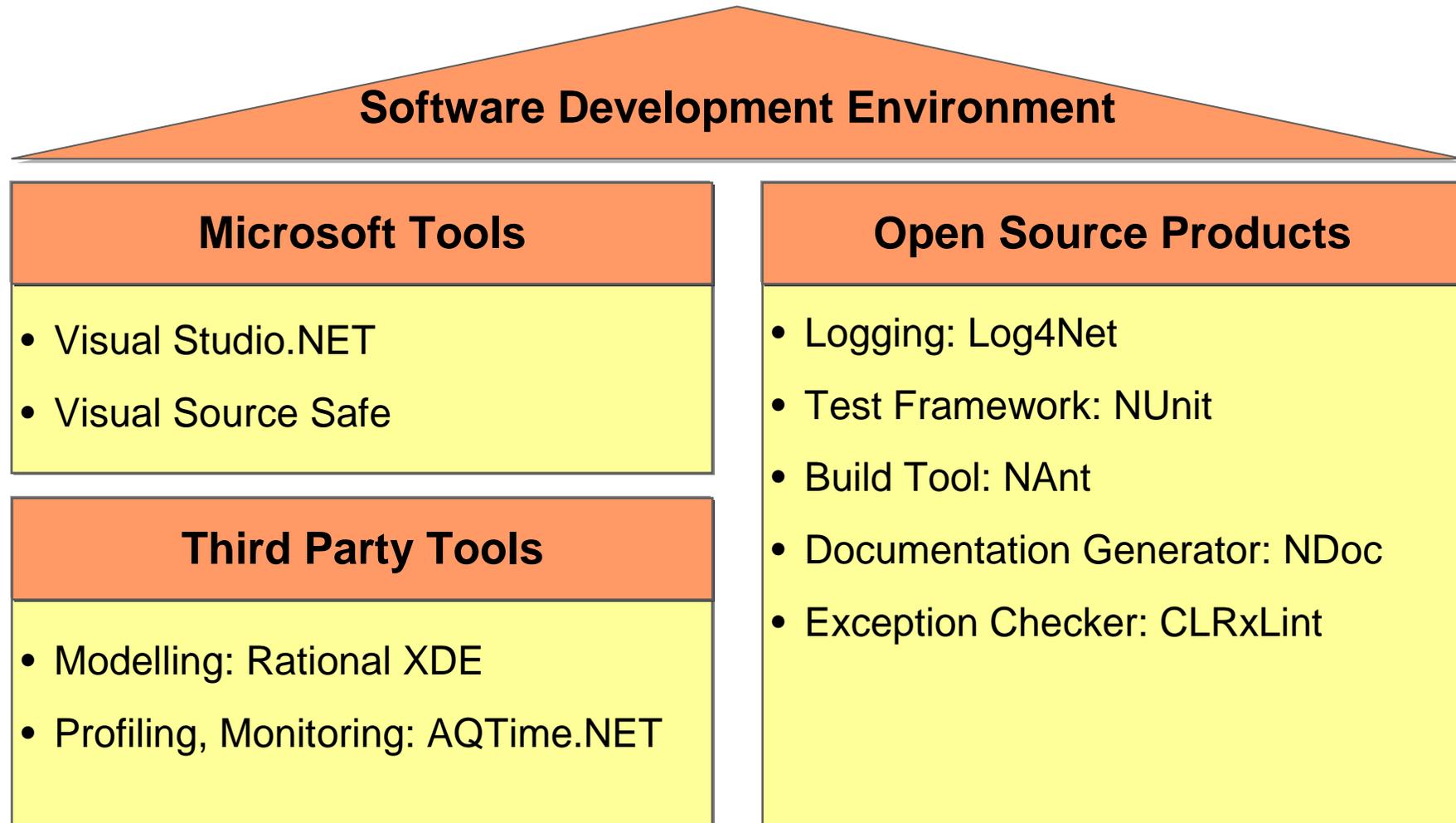
n **Development Environment**

Design

Going Live

Lessons Learned

# Open source and third party tools reduce development time



## The development environment has very useful features, but there are deficits regarding team development

### Advantages

- Integration of Visual Studio .NET with other Microsoft Products
- Integrated Visual Designer makes GUI development easy and fast
- Syntax Highlighting and Intellisense
- Expanding and Hiding Regions
- Generation of XML-Documentation
- Easy integration of additional tools

### Problems

- Versions can get lost
  - Class was changed by another developer between start of Visual Studio and checkout
- Bugs in some tools
  - Debugger
  - Visual Designer
  - Rational XDE
- Development in large projects (more than about 500 classes):
  - Build of large projects not sufficiently supported
  - Compilation of individual classes not possible, only of complete assemblies
  - Build of many DLLs time consuming

## Workarounds exist to handle the problems

Problem	Solution
Problems with Source Control	<ul style="list-style-type: none"><li>n Use latest versions of Visual Studio.NET and Visual Source Safe</li><li>n Allow multiple checkout</li></ul>
Modelling Tools (Rational XDE)	<ul style="list-style-type: none"><li>n Define guidelines for the modelling tools and their application</li><li>n Synchronize model and sources only at well defined dates, e.g. milestones</li></ul>
Build Process	<ul style="list-style-type: none"><li>n Use conventions (common paths)</li><li>n Implement and use global build process (Tools: NAnt, scripts, and BuildIT.Net)</li></ul>

# Agenda

Introducing sd&m

Our Projects

Why .NET?

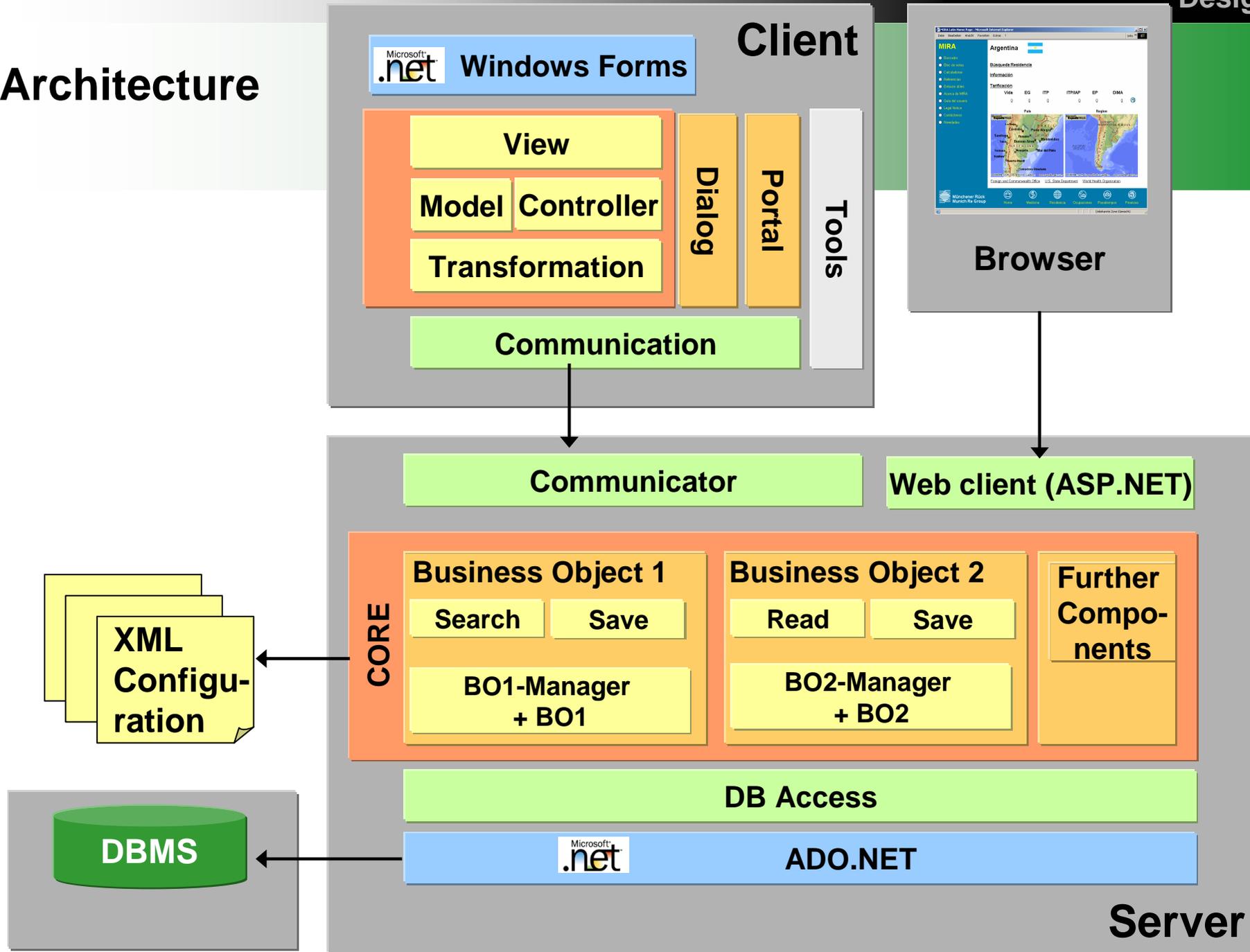
Development Environment

n **Design**

Going Live

Lessons Learned

# Architecture



## In order to build smart clients wrapper classes for accessing Windows.Forms controls are useful

Use Wrapper for .NET-GUI-Controls in order to implement GUIs

- Ø Analog methods for the control of GUI elements
- Ø Additional methods e.g. for checks
- Ø Extensions of methods or controls regarding
  - table control
  - internationalization
- Ø Migration to mobile devices is simple

## With the .NET framework web services can be implemented fast and easily

- n In order to create a web service just add the attribute [WebMethod] to a method

```
[WebService( Description = "WebService1" )]  
public class WebService1 :  
    System.Web.Services.WebService  
{...}
```

- n Visual Studio generates
  - WSDL documents
  - GUIs for testing
  - Proxies for accessing the web service from other applications
    - when corresponding WebReference is added to the project
  - In and Out parameters are automatically converted to and from XML

## Complex object structures can be transferred easily with .NET technology

### n .NET supports:

- simple data types and enumeration types
- own data types (also in arrays), if marked as XML-serializable:

```
using System.Xml.Serialization;

class MyDataType{ ... }
[XmlInclude( typeof( MyDataType ) )]
public class DataType{...}
```

### n Not supported:

- Hashtables
- Own data types in IList (Bug in Visual Studio.NET)

### n Exchange of data types between applications based on different technologies (e.g. programming language)

- transformation (e.g. via XSLT) may be necessary

## Using DataSet as data container may result in performance problems

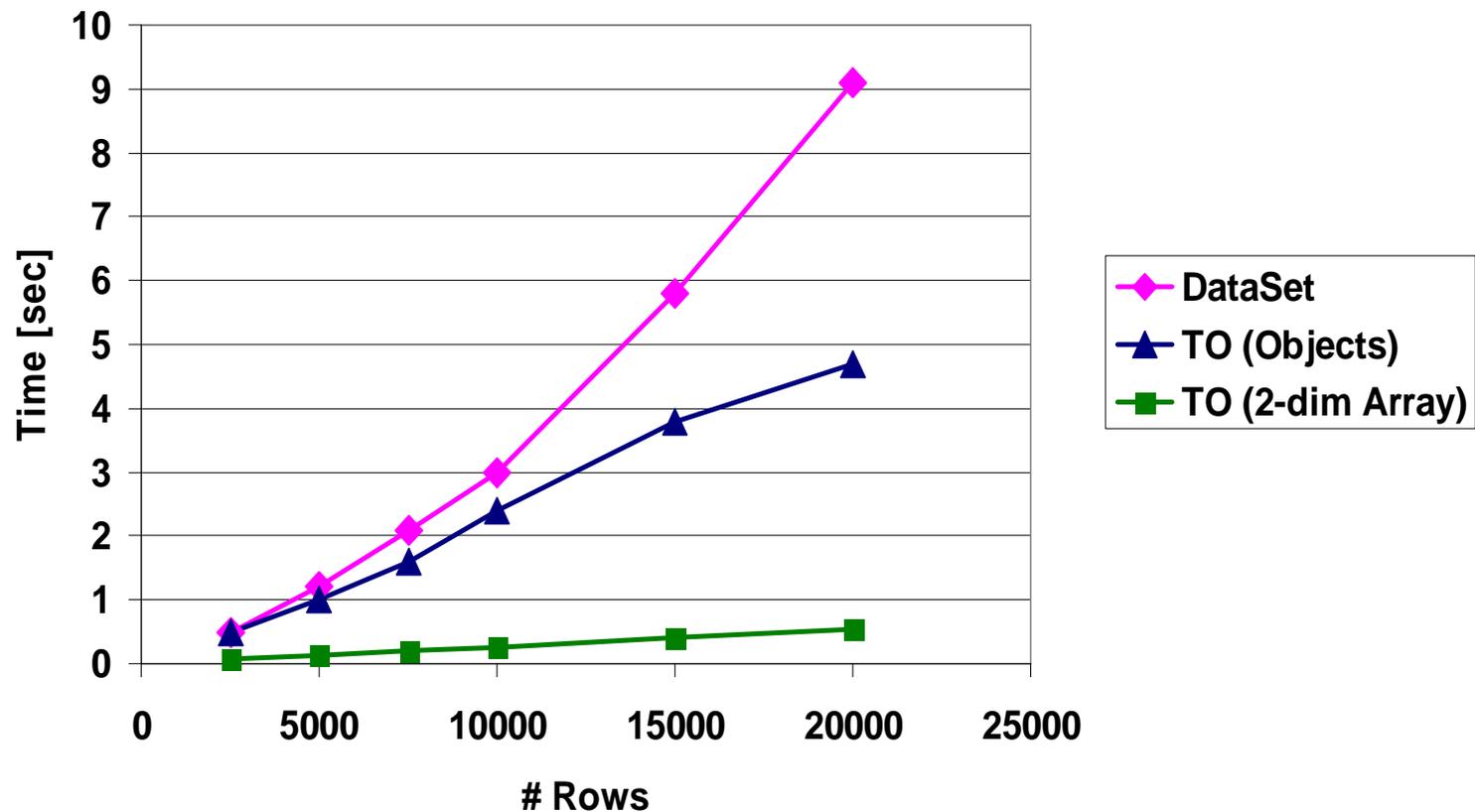
### Example:

- n Transport the following data:

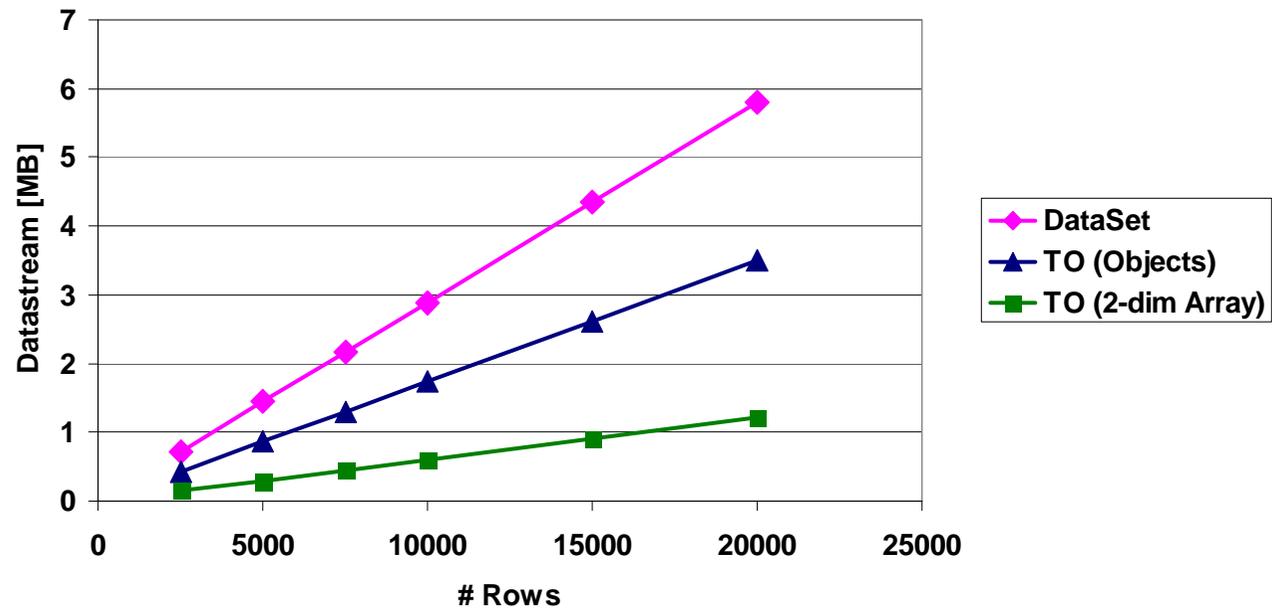
Country	Capital	Area	No 1	No 2	No 3
Germany	Berlin	Europe	8234	3575	634,52
China	Beijing	Asia	2345	243	265,34
...	...	...	...	...	...

- n Possible data container (TO):
  - **DataSet** containing one table
  - **TO (Objects)**  
Hashtable containing rows:  
number of the row is key, value is object containing one row
  - **TO (2-dim. Array)**  
Data is stored in a two-dimensional matrix (String[][])

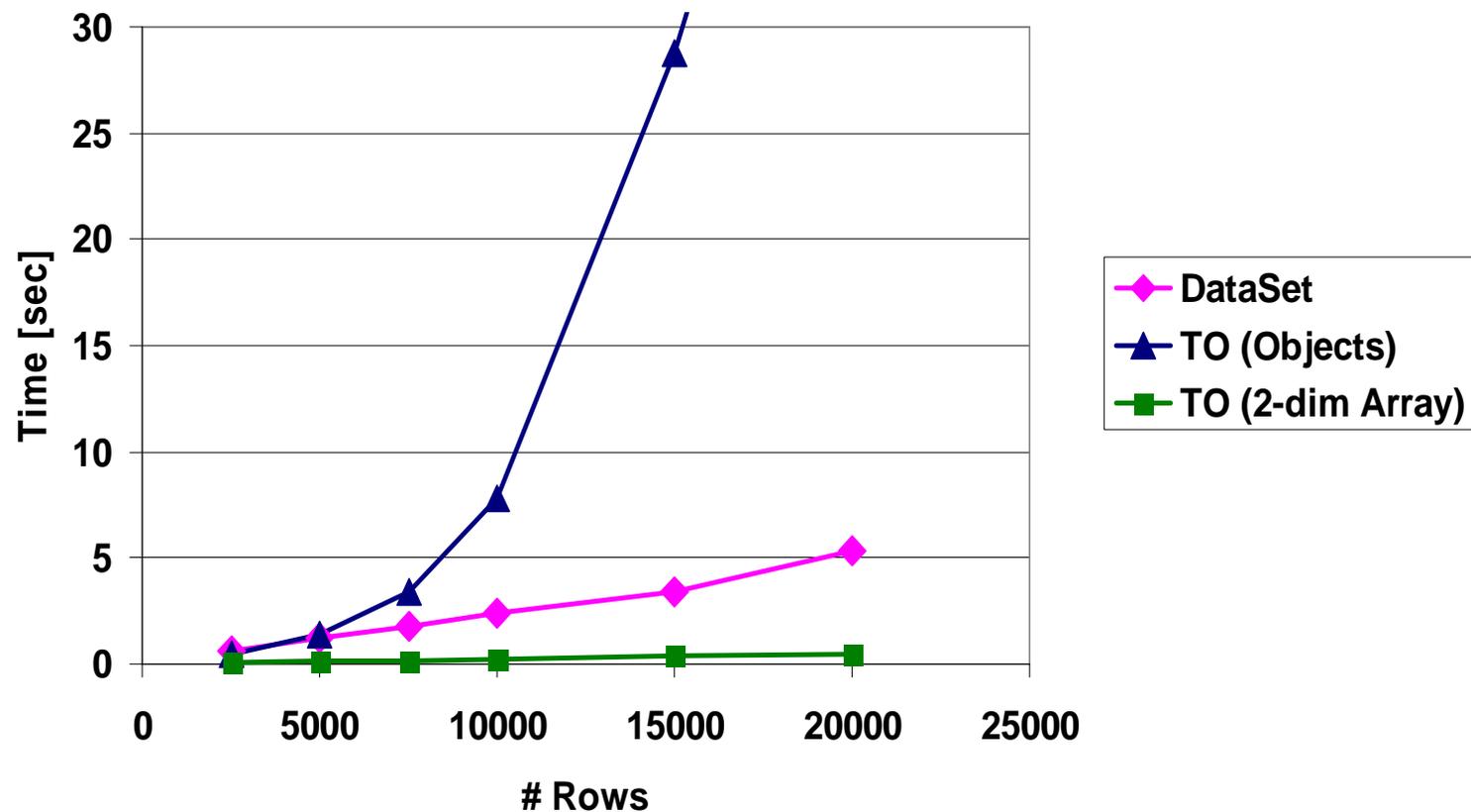
# The time necessary for serializations depends on the type of data container



... the net traffic depends on the structure of the objects ...



# The two-dimensional array is also the fastest to be deserialized



## Communication via webservices is slow



- n Binary Serialization is faster than XML/SOAP via HTTP-Channel

In our project:  
XML/SOAP takes about three times  
(in some examples 10 times)  
as long as binary communication

There is no reason to use web services technology in homogeneous environments

## Using the right data container for communication may be important to design applications with good response time

In order to communicate with acceptable performance

- n Do not transport complex structures  
(DataSets containing linked tables are even slower than Hashtables)
- n Binary communication is faster than XML/SOAP via HTTP-Channel
- n Using Zip-Packages reduce net load and may increase performance
- n Test different options and decide depending on the context

## In our projects as in many applications the integration of Microsoft products is important



Word

- Client calls Word in order to process Word documents (Links, Conversion to HTML, Key word extraction)
- Call back in Word for additional functionality



Access

- Integration of existing business logic



Outlook

- Sending emails via Outlook client

Preview of documents as client plug-in



HTML documents via Internet Explorer



PDF documents via Acrobat Reader

MIRA Maintenance - [UK - Residential - Edit - Russia]

Subject Edit Approve Tools Window Help

General

- Market Versions
  - International
  - UK
    - In work
    - Ready for approval
    - Contents
      - Underwriting
        - What's new
        - Medical
        - Residential
          - Items
          - Submenus
          - Additional doc
        - Occupations
        - Questionnaires
        - Pastimes
        - Calculators
        - References
      - Claims
    - China

Item Russia

RatingTree Information Help Texts Synonyms Special Info Menu Supplementary Info Questionnaires What's New

Source

All Help Texts

Referenced Help Texts

- Permanent Residence
- Without dangerous re
- With dangerous regio
- Temporarily only

Help Texts

Help Texts

DANGER  
TEMPORARY

Edit Add Delete

Preview

Enable Preview

**Russia**

**Dangerous regions in [Russia](#) include**

Region	Security risks
<ul style="list-style-type: none"> <li>the Chechen Republic,</li> <li>Ingushetia,</li> </ul>	High
<ul style="list-style-type: none"> <li>Dagestan and North Ossetia,</li> <li>Karachai-Cherkessia,</li> </ul>	Considerable
<ul style="list-style-type: none"> <li>Kabardino-Balkaria (including the Elbrus area)</li> <li>and to eastern and southern parts of Stavropol Krai, particularly where it borders Chechnya and North Ossetia.</li> </ul>	Moderate

Save Reset

Last updated: 04.12.2002 11:30:40, walthes Last published:

Welcome to MiraMaintenance Client

## Microsoft products as well as existing applications can be easily integrated using COM+

- n Calling Word, Access, Internet Explorer, Outlook und Acrobat Reader via COM+ is fast, reliable and stable

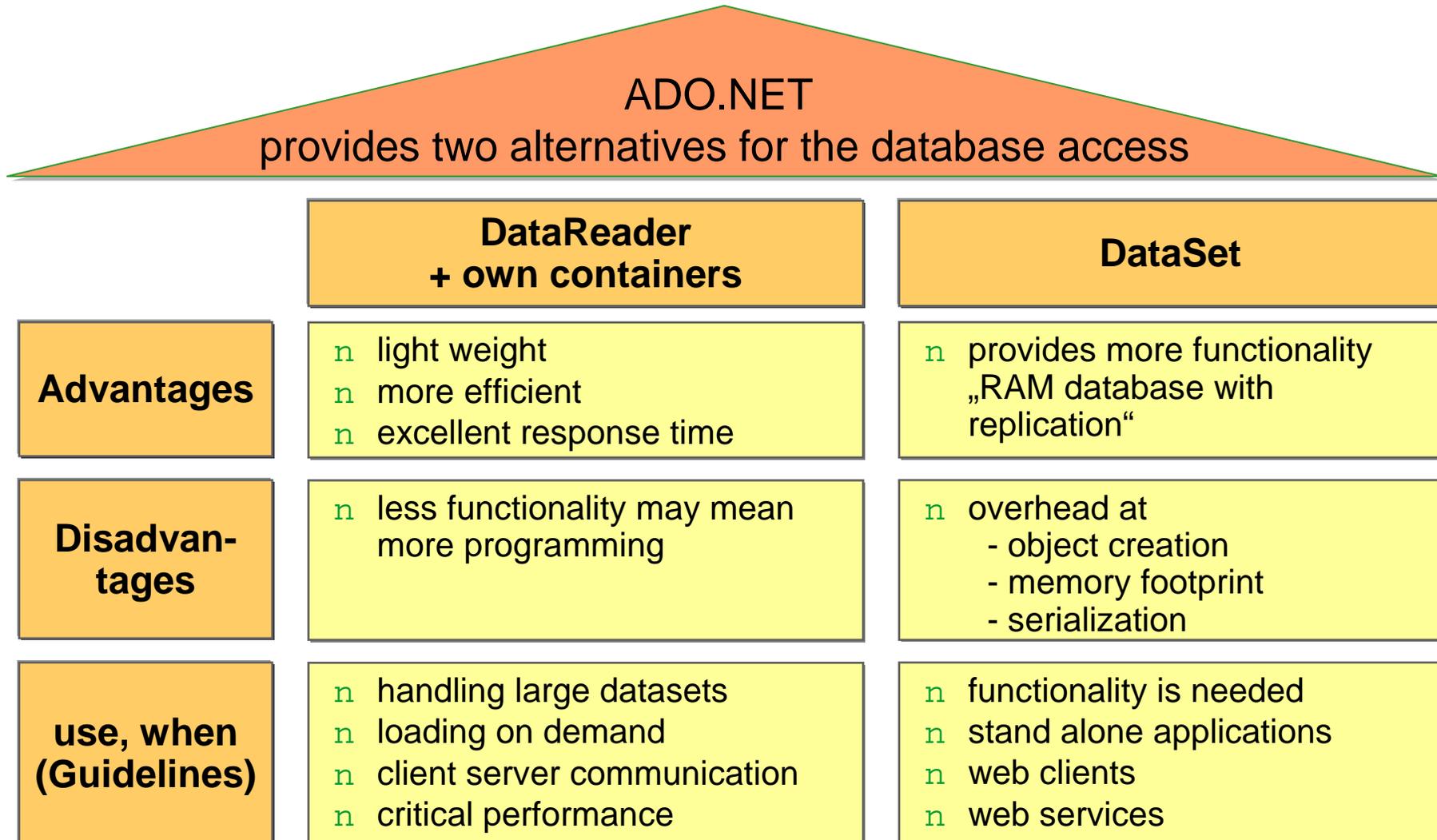


- n Integration similar to VBA access to office
- n In the recent versions Word, Excel, ... can not be integrated directly within Windows.Forms-User Interfaces



- n Libraries of Office2000 and OfficeXP are different:
  - Calls have to be changed
  - Encapsulate calls

# The right choice of the database access can be important for the performance of the application



# Agenda

Introducing sd&m

Our Projects

Why .NET?

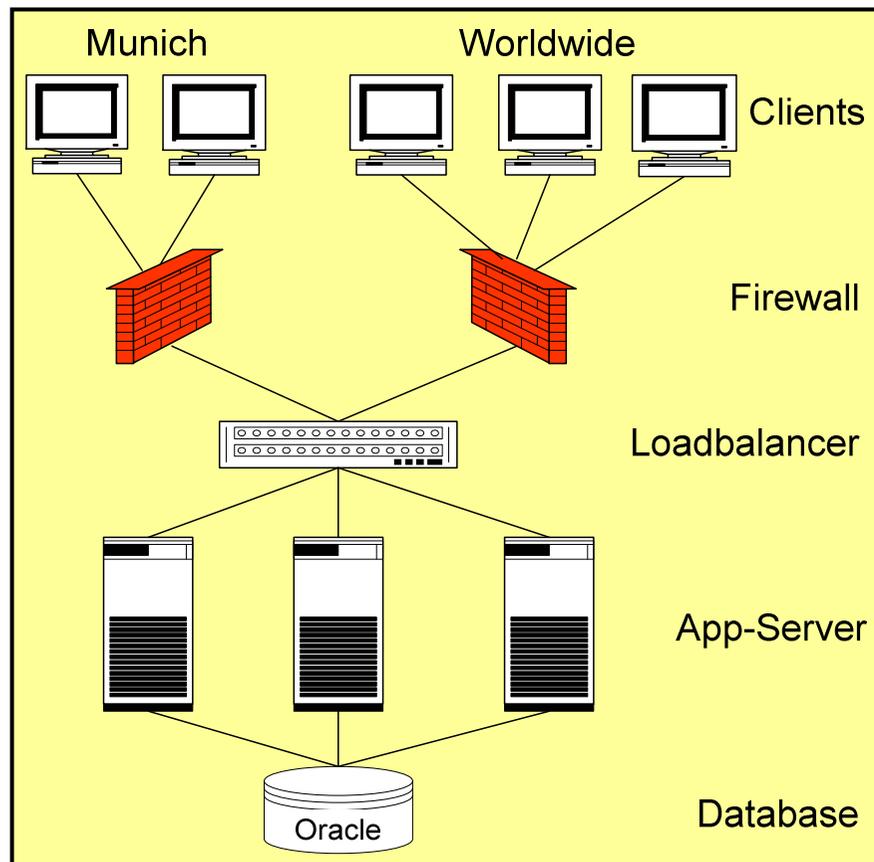
Development Environment

Design

n **Going Live**

Lessons Learned

# Deployment and administration of .NET applications is very easy, applications run stable



## Deployment

- Framework without problems
- Application:  
Copy DLLs, install services

## Stability

- no problems concerning CLR and Framework
- daily reboot of the servers  
à Garbage Collection ok

## Performance

- Response in general < 1 sec
- Small delay at startup

# Agenda

Introducing sd&m

Our Projects

Why .NET?

Development Environment

Design

Going Live

n **Lessons Learned**

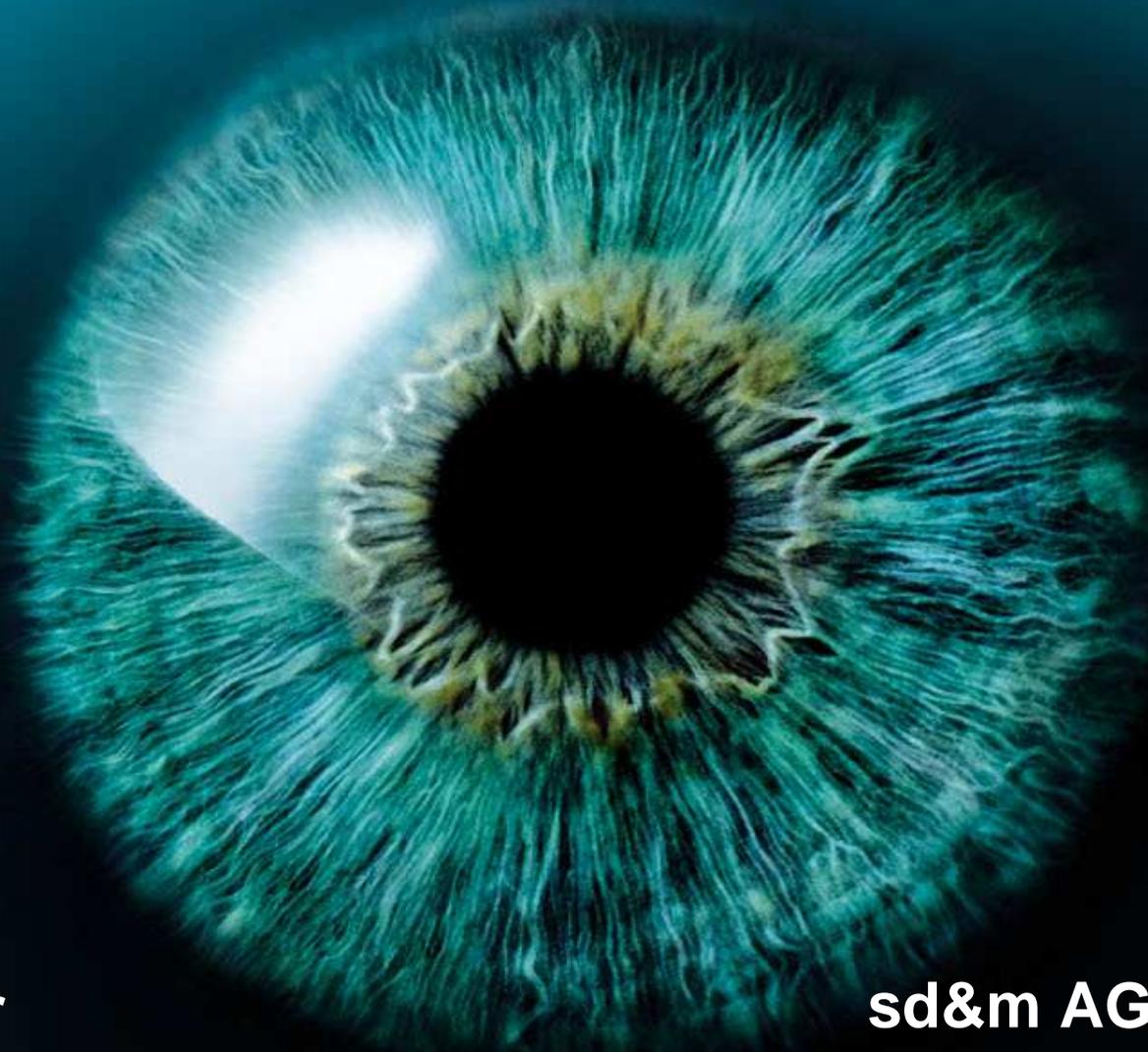
## .NET is an innovative development platform

- n .NET provides a modernized Microsoft platform
  - Concept is more modern and more homogeneous than J2EE
  - C# is an evolution of Java und is the next step in the right direction
- n Summary: .NET works
  - Stable according to load and availability
  - Excellent performance
  - .NET Framework is a good basis for development
  - Adaptions and extensions are very useful (own basic components)
- n Cost reductions compared to J2EE, when
  - building web applications or web services
  - integrating Microsoft products

## Some aspects are very important to build stable and well performing applications with .NET

- n **Software Development Environment:**  
Excellent first version with some bugs especially in large projects
- n Standard OO-**Architectures** can be applied to .NET, but extensions to the framework may be useful
- n **Communication** time depends on the structure of the objects transported
- n **Type of communication** is crucial to performance of the application
- n **COM-Calls** are easy to implement and can be applied to integrate existing applications
- n **Going Live** causes no problems with deployment and administration

# Contact



**Harald Haller**  
**Phone + 49 89 63812-431**  
**Email [haller@sdm.de](mailto:haller@sdm.de)**

**sd&m AG**  
**Carl-Wery-Str. 42**  
**81739 Munich, Germany**