An Internet of Services - Visions
PESOS 2012 Keynote

June 4, 2012

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Introduction
Credit Suisse Group

Credit Suisse Group today – key facts

- **Global bank** headquartered in Zurich, serving clients in private banking, investment banking and asset management.

- **Registered shares** of Credit Suisse Group AG (CSGN) are listed in Switzerland (SIX) and as American Depositary Shares (CS) in New York (NYSE).

- Total number of **employees***: ~50,700.

- The Group's **long-term ratings*** are: Moody's Aa2, Standard & Poor's A, Fitch Ratings AA-.

* as of November 2011

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A Global Network to Serve Our Different Business Needs

About 17'000 specialists are ready to serve our different business needs around the world*

New York
Main Business: Investment Banking

London
Main Business: Investment Banking

Zurich
Main Business: Private Banking, Private and Corporate Clients

70 %

Raleigh
Captive near-shore, primarily supporting NY activities

India
Outsourced and captive offshore in different locations

Singapore
Captive offshore supporting NY, ZH, London and onshore Asia

30 %

* as of March 2011

IT Division Facts & Figures*

Financials / Human Capital Portfolio

- IT budget is over CHF 3.75 billion, of which
  - approx. 59% Run-the-Bank (RtB)
  - approx. 41% Change-the-Bank (CtB)

- 17,000 internal & external Employees

- One central IT Division with people in 64 different legal entities globally

Other Key Figures

- 67,100 supported users in 550 locations

- 4 main hub Production-DR pairs of data centers consuming 14 MW** of power (approx. 25,000 US homes)

- Hardware
  - 95,000 workstations / laptops
  - 25,000 physical servers with more than 33,000 terabytes of storage
  - 8 host / mainframe CPUs with 73,000 MIPS*** provided

- Software
  - 6,000 applications

- Email
  - 70,000 email accounts
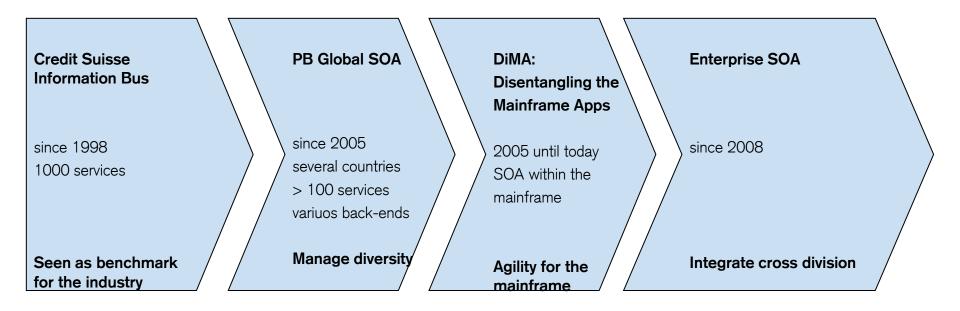
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*　　as of April 2011
**　　MW = Mega Watt
***　MIPS = Million Instructions per Second

14 Years SOA@Credit Suisse Experiences

Credit Suisse does SOA since 1998

Credit Suisse Information Bus

since 1998
1000 services

Seen as benchmark for the industry

PB Global SOA

since 2005
several countries
> 100 services
variuos back-ends

Manage diversity

DiMA: Disentangling the Mainframe Apps

2005 until today
SOA within the mainframe

Agility for the mainframe

Enterprise SOA

since 2008

Integrate cross division

"Credit Suisse succeeded in building a highly business-critical integration infrastructure. The company is fully experiencing the benefits of SOA and the componentization of core business applications. However, to reach that desired state, Credit Suisse went through a lengthy and expensive endeavor that only leading-edge, technically sophisticated enterprises will be able to tackle."

Gartner Group

Main Ingredients of SOA at Credit Suisse

1. Decomposition into Components

2. Credit Suisse eXchange Bus (CSXB)

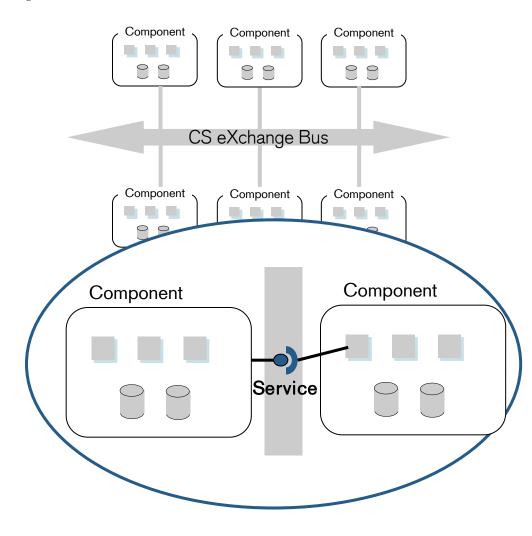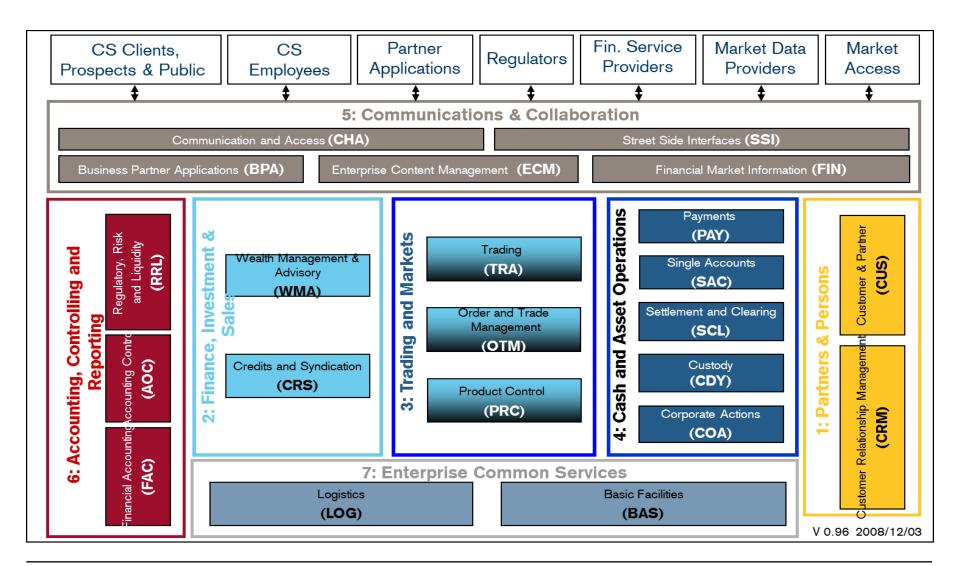3. Central Service Repository

4. SOA Governance
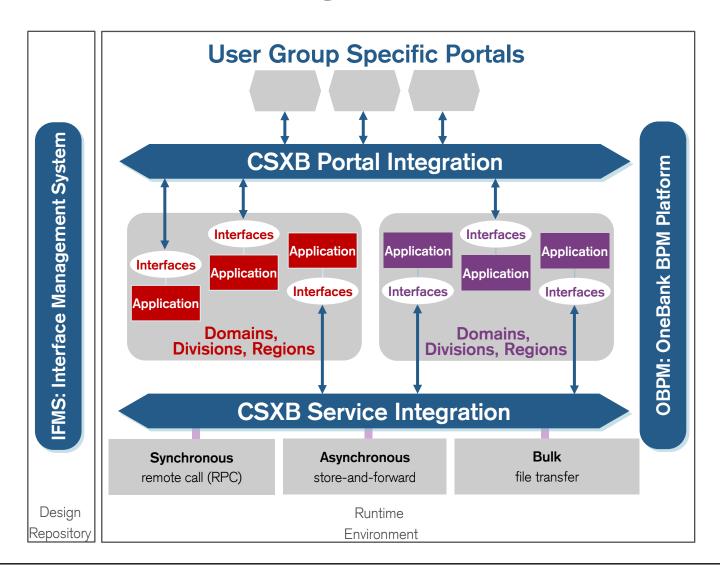
1. Decomposition into Components

- IT landscape decomposed into business domains consisting of related business data and functions

- These coarse-grained components are (de)coupled through services

- Services expose a business view, i.e. they are not coupled to database designs or existing data structures
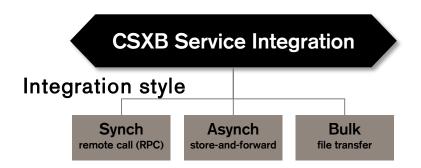
Application Domains as SOA Components

CS Clients, Prospects & Public	CS Employees	Partner Applications	Regulators	Fin. Service Providers	Market Data Providers	Market Access

5: Communications & Collaboration

Communication and Access (CHA)	Street Side Interfaces (SSI)
Business Partner Applications (BPA)	Enterprise Content Management (ECM)	Financial Market Information (FIN)

6: Accounting, Controlling and Reporting
- Regulatory, Risk and Liquidity (RRL)
- Accounting Control (AOC)
- Financial Accounting (FAC)

2: Finance, Investment & Sales
- Wealth Management & Advisory (WMA)
- Credits and Syndication (CRS)

3: Trading and Markets
- Trading (TRA)
- Order and Trade Management (OTM)
- Product Control (PRC)

4: Cash and Asset Operations
- Payments (PAY)
- Single Accounts (SAC)
- Settlement and Clearing (SCL)
- Custody (CDY)
- Corporate Actions (COA)

1: Partners & Persons
- Customer & Partner (CUS)
- Customer Relationship Management (CRM)

7: Enterprise Common Services

Logistics (LOG)	Basic Facilities (BAS)

V 0.96 2008/12/03

2. Credit Suisse eXchange Bus (CSXB)

User Group Specific Portals

CSXB Portal Integration

Interfaces · Application · Interfaces · Application · Interfaces · Application

Domains, Divisions, Regions

Interfaces · Application · Interfaces · Application · Interfaces · Application

Domains, Divisions, Regions

CSXB Service Integration

| **Synchronous** remote call (RPC) | **Asynchronous** store-and-forward | **Bulk** file transfer |

IFMS: Interface Management System

OBPM: OneBank BPM Platform

Design Repository

Runtime Environment

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Integration Styles, Infrastructures and Technologies

- **CSXB**
  - Logical concept
  - Multiple integration styles
  - Standard integration technologies

- **Example**
  - Requirement: get all customers of a relationship manager, results to be displayed on a screen
  - Integration style: synchronous request response service operation
    searchCustomers(r : RelManager) : Customers
  - Infrastructure and technology: Web Service exposed via Service Bus
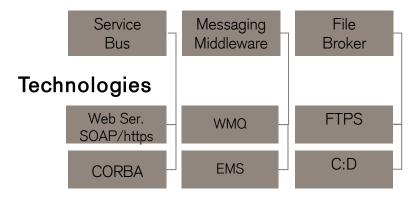
CSXB Service Integration

Integration style

Synch remote call (RPC)	**Asynch** store-and-forward	**Bulk** file transfer

Abstract styles for service descriptions (repository)

Infrastructure binding

Infrastructures

Service Bus	Messaging Middleware	File Broker

Technologies

Web Ser. SOAP/https	WMQ	FTPS
CORBA	EMS	C:D

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3. Central Service Repository

Interface Management System (IFMS)
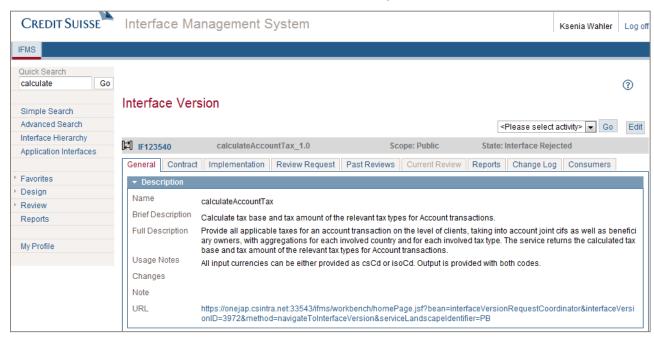
- Service Catalog

- Design tool

- Governance enforcer

- Lifecycle management

- Code generator

IFMS User Community

- ## Service Designer
  - Design new service interfaces
  - Import from other design tools (e.g. modeling tools)
  - Submit interfaces to the review process

- ## Service Reviewer
  - Review all new service interface designs

- ## Service Developer
  - Find service interfaces to call from their applications
  - Download code snippets for service invocation
  - Generate server-side skeletons when implementing services

- ## Service Portfolio Manager
  - Manage service portfolios and detect redundancies
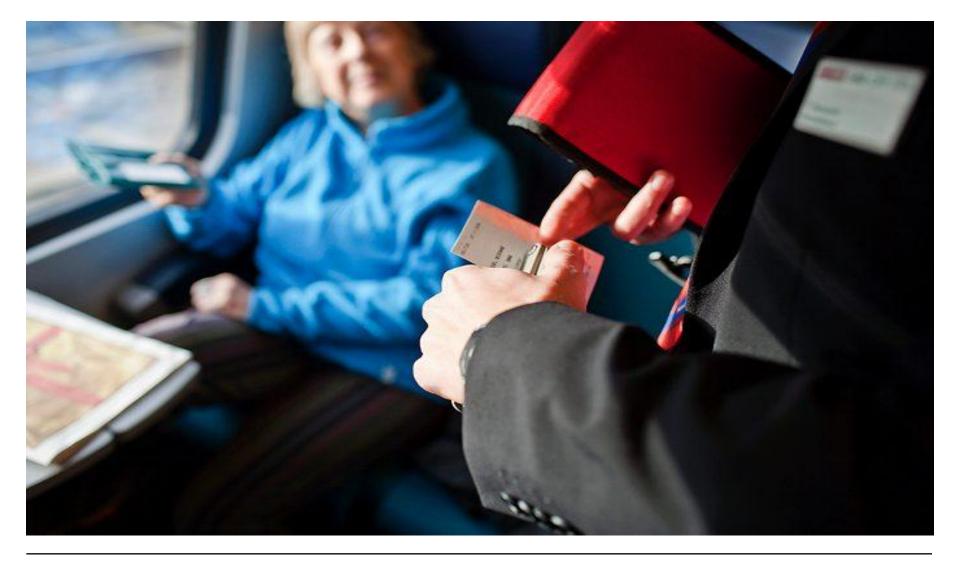
4. SOA Governance

IT Architecture Disciplines at Credit Suisse

Business Architecture

The business model based on the utilization
of optimal processes and organizational structures
Which functions, processes, and organizations ?

Application Architecture

The application landscape is well
structured and established according to
common principles
Which applications and components?

Technical/Platform Architecture

Standardized application platforms based on
standardized technical components
Which IT infrastructure?

Data Architecture
Standardized Data and Information lifecycles, representation and integration

Integration Architecture
Standardized interfaces and infrastructures for the integration of applications

Security Architecture
Adequate protection of processes and data, dependable traceability of business transactions

Systems Management Architecture
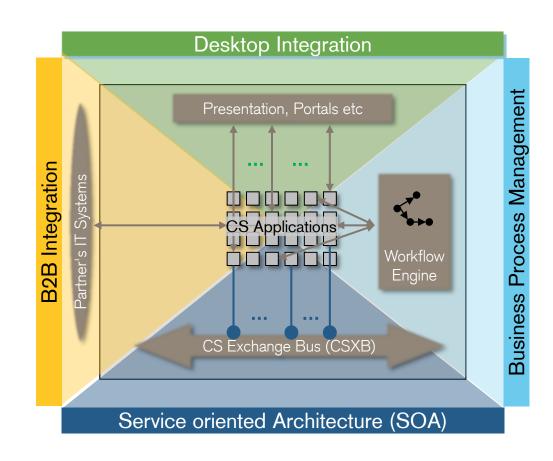Cost efficient and dependable operation of the IT systems

IT Architecture Governance and Processes

Well-defined processes assure transparent decision-making, adequate communication and consistent enforcement
of architecture with respect to the current situation

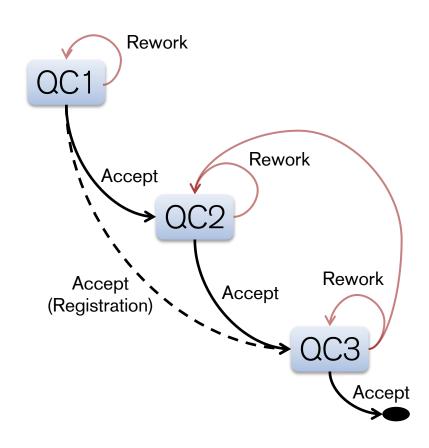# Integration Architecture
Main Focus Areas

- **Reduce complexity** through componentization and managed interfaces

- Promote integration through a logical **bankwide integration** bus with multiple supporting infrastructures

- Standardized portal architecture to support **cross-divisional sharing**

- Business Process Management standards **improve speed and quality of business processes**

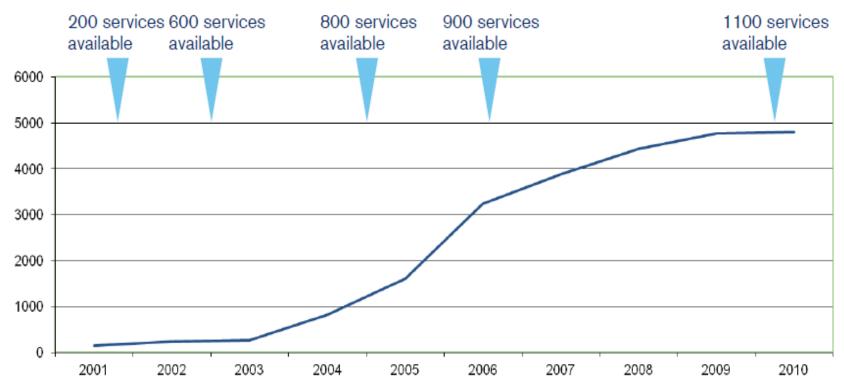- **Secure and flexible** B2B communication using industry standards

Desktop Integration

B2B Integration

Business Process Management

Partner's IT Systems

Presentation, Portals etc

CS Applications

Workflow Engine

CS Exchange Bus (CSXB)

Service oriented Architecture (SOA)

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Quality Assurance Process

- **QC1 - Integration Architecture Team**
  - Is the service understandable?
  - Is the service necessary?
  - Is the service positioned correctly?
- **QC2 - Cross-functional Review Team**
  - Is the service and the new data types following the design principles?
  - Is the service using the correct types?
- **QC3 - Tool & Process Support**
  - Are all QC Obligations fulfilled?
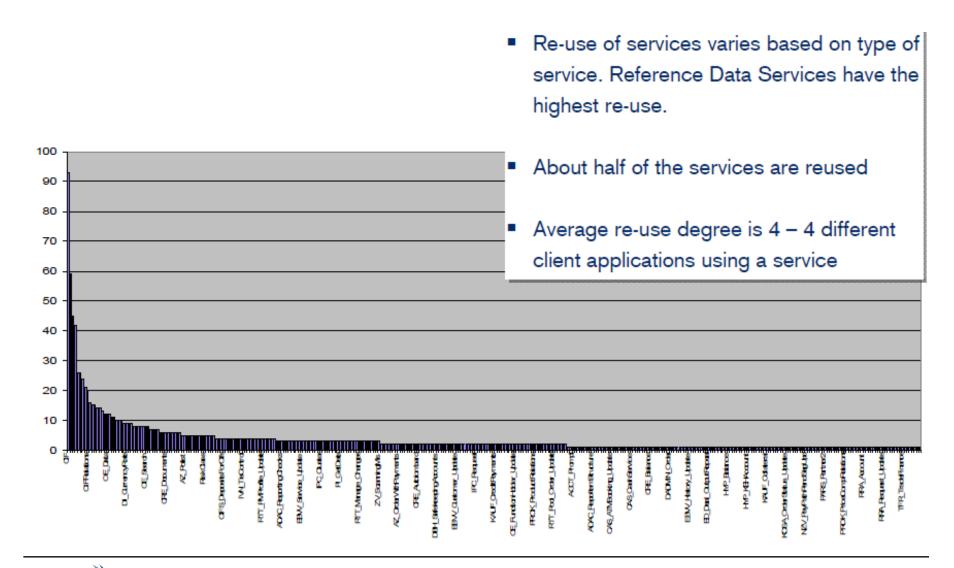 - Is it implemented as specified?

QC Process

QC1 — Rework
QC1 → Accept → QC2
QC1 — Accept (Registration) → QC3
QC2 — Rework
QC2 → Accept → QC3
QC3 — Rework
QC3 → Accept

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Experience: Use of services follows availability

- Wide use of services follows a critical mass of available services
- Today ~ 5 billion service calls a year in Switzerland
- Fully decoupled platform some years ahead
- Core banking system on mainframe completely decoupled from remainder of platform

Experience: Reuse is very uneven

- Re-use of services varies based on type of service. Reference Data Services have the highest re-use.

- About half of the services are reused

- Average re-use degree is 4 – 4 different client applications using a service

Visions: Strategic Challenges
and Next Steps for (Service) Development

External Trends Review

Mid- and long-term (5-10 years) relevant topics for bank IT units*

5-year perspective

Mastering of "technical debt"
- Increased software quality: (re-)establish requirements specs, (re-)design specs, code, test cases and test data
- Data (re-)design and master data management

Industrialization of Solution Delivery
- Flexibility of development procedures (e.g. adaptation to DWH, COTS integration and reengineering)
- Tools for development, test efficiency & quality assurance

New types of business requirements
- Security and risk tolerance in global distributed environments
- Business Intelligence for big data and analytics

10-year perspective

The future IT infrastructure – the cloud
- Fully automated data centers with completely standardized HW components
- SW has to fulfill strict quality criteria:
  - limited size and complexity
  - well-defined runtime features (e.g. response time)
  - 100% tested and error-free
  - standardized interfaces
  - decoupled architecture on all classical layers (UI, business logic, data)
- SW will be generated from sophisti-cated models to be independent from cloud providers

* Based on studies by [2] Accenture, [3] Cap Gemini, ¨[4] Cast/Gartner, see p. 31

External Trends Review
Impact on solution delivery

Description		Challenges for solution delivery

Business environment changes

- The leader in competition will be the one with simpler, smarter and more reliable solutions for
  - bank customers (e.g. portfolio advisory)
  - business users (e.g. business intelligence)
  - regulators (e.g. global reporting)

- Improved business/IT alignment
  - to understand customer needs and business efficiency (e.g. UI)
  - for an agile adaptation to new requirements
  - to reduce the in-house value chain

Technology changes

- Cloud computing as the next technical revolution is characterized by
  - a fully automated IT production
  - SOA services with model-generated code
  - distributed data with risk-based security

- Methods, tools and skills for
  - implementing SOA services
  - model-driven development and model-generated components
  - strict SW quality assurance
  - build-in security and dynamic runtime behavior

Technical debt

- The legacy of immature development sums up to ~270 m$/100 mLOC[4] for
  - missing requirements specifications
  - missing design specifications
  - bad code quality
  - missing test cases and test data

  - data design and master data management
  - software and documentation analysis
  - reengineering

mLOC = Millions lines of code; ~100 mLOC is the Swiss Banking IT Platforms code base

Next steps for our Internet of Services

- Globalization of SOA within Credit Suisse
  – Standardization of (reference) data structures
  – global support organizations for SOA infrastructure

- Migration of 2'600 CORBA service operations to Web Services

- Consolidation of data flows between front and back offices

- Adoption (and improvement) of financial industry standards, e.g. SWIFT

- Global management of the ever-growing service portfolio

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Visions: Research Topics

Where we reach the limits – areas for research I

- Security remains a challenge
  - Secure passing of the original initiator to all services involved (in the absence of sessions)
  - Second line of defense: Application level firewalls analyzing service traffic, distributed logging of service invocation, service monitoring for unexpected use
  - Fine-grained access control
- Managing large service networks
  - Version/release management with 1000s of services and 100000s of clients, semantic compatibility
  - System Management, service-level control, fault-tolerant designs, capacity management, service replication
  - Testing of complex component networks
  - Accounting of service use
  - Development governance, balancing reuse with demand-driven development
  - Cross platform interoperability

Where we reach the limits – areas for research II

- Semantic alignment
  - Keeping large service landscapes semantically aligned, federation
  - Semantics in dynamic service discovery
  - Systematically linking integration architecture to business architecture (information model, process model, function model)
  - Blending external standards with internal extensions
- High volume, low latency implementations
  - Market data, 100000s of messages per second, distributed to many clients, publish subscribe pattern, sub-ms latency expectation
  - Special HW, FPGA
  - Special Network-Devices
  - Simplified protocols
- Cloud services
  - Service markets
  - Domain-based interface standardization
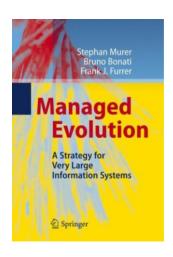 - Security
  - Pricing

Q&A

Literature/Contact

Literature/Contact

Literature

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[2] Accenture: Technology Vision 2011
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[3] Capgemini: Studie IT-Trends 2011
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[4] Gartner-CAST Whitepaper: How to Monetize Application Technical Debt
http://blog.castsoftware.com/gartner-cast-whitepaper-how-to-monetize-application-technical-debt/

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