

**ENTERPRISE ARCHITECTURE
FOR INTEGRATION:
Rapid Delivery Methods and Technologies
Third Edition**

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With Foreword by John Zachman

**CHAPTER 15: MODELING TOOL, RIA
AND CLOUD COMPUTING –
PRODUCT DESCRIPTIONS**

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Chapter 15: Modeling Tool, RIA and Cloud Computing Products

In this product description section of Chapter 15, we will discuss the capabilities of some modeling tool products, a number of Rich Internet Application (RIA) and Cloud Computing products, and the strategies used by their vendors. I will not attempt to cover all products in the market. I will only address specific products that, by their innovation, will enable you to see the technology trends that are developing.

Modeling Tool Product Descriptions

The following modeling tools are covered in this section:

- Rational Software Architect (from IBM)
- System Architect (from Popkin Software, now part of IBM)
- Proforma Provision
- IDS Scheer ARIS (now part of IBM)
- Visible Advantage and Visible Analyst (from Visible Systems Corporation)
- Enterprise Architect (from Sparx Systems)

IBM Rational Software Architect

Rational Software was the modeling tool market leader with Rational Rose, Rational XDE and the Rational Unified Process (RUP) [a]. *Rational Rose* pioneered UML visual modeling and development in the 1990s. It is a stand-alone modeling tool that can integrate at the *Application Programming Interface* (API) with *Integrated Development Environments* (IDEs) such as J2EE and *Microsoft Visual Studio* (see Chapter 13).

In 2002 *Rational XDE* extended this integration as a plug-in that could be installed inside J2EE and *Microsoft Visual Studio.Net* IDEs. Rational XDE helped bring the concept of *Model-Driven Development* (MDD) closer to developers. Customizations were also added as early support for *Model-Driven Architecture* (MDA) [b]. Rational XDE used a patterns engine that extended MDD to pattern-based development.

^a See <http://www.ibm.com/rational/> for details of these earlier Rational modeling tools.

^b Model-Driven Development (MDD) and Model-Driven Architecture (MDA) has been the open architecture direction proposed by the Object Management Group (OMG). See <http://www.omg.org/>.

IBM purchased Rational Software in 2003; it is now known as IBM Rational. IBM consolidated Rational Rose and Rational XDE products into a single product family: called *Rational Rose XDE Developer*.

Even before the purchase, IBM and Rational had been working together to integrate MDD capabilities into the open source Eclipse framework and the IDEs built on top of Eclipse. An early result of this work saw the addition of a code visualization and visual editing feature to *WebSphere Studio Application Developer* in 2003. This was used to develop Java implementation-level models. We discussed this briefly in Chapter 13.

The announcement by IBM of *Rational Software Architect* and *Rational Software Modeler* in October 2004 extended the integration of MDD with the open Eclipse platform.

Rational Software Architect [c] is the next-generation product from IBM for *Model-Driven Development* and *Model-Driven Architecture*. It provides UML Version 2 (UML 2) visual modeling support, along with code generation and visualization capabilities. As a subset, *Rational Software Modeler* [d] supports all the UML 2 visual modeling features found in *Rational Software Architect*, but not the code generation or visualization support. The October 2004 announcement also included the *IBM Rational Application Developer for WebSphere Software*: the next version and renaming of the *IBM WebSphere Studio Application Developer* product. The directions that these products will take are discussed in an IBM White Paper [e].

The Eclipse open source platform is the technology foundation that is used by IBM for the *IBM Software Development Platform (SDP)* of the future. As part of the initial release, *Rational Software Architect* takes various features from *Rational Rose*, *Rational XDE* and *WebSphere Application Developer*. According to IBM in the above White Paper [5], it also:

“Adds MDD capabilities, introduces new structural review and control capabilities and hosts it all on the Eclipse 3.0 platform. The result is a comprehensive design and development solution specifically targeted to the needs of software architects who also develop or otherwise touch code”

Rational Software Architect also includes all the capabilities found in *Rational Application Developer for WebSphere Software*. Full support for MDD has been added, including UML 2 modeling, code generation, patterns and model transformations, as well as a new approach to implementing the MDA style of development.

The UML 2 support in *Rational Software Architect* includes nine UML diagrams: *Use Case*; *Class*; *Sequence*; *Activity*; *Composite Structure*; *State*

^c *Rational Software Architect* is at <http://www-306.ibm.com/software/awdtools/architect/swarchitect/>.

^d *Rational Software Modeler* is a subset product of *Rational Software Architect* containing only UML visual modeling support. See <http://www-306.ibm.com/software/awdtools/modeler/swmodeler/>.

^e See <http://public.dhe.ibm.com/software/rational/web/whitepapers/rsa-cernosek-wp.pdf> for the IBM White Paper: “Next-Generation Model-Driven Development”.

Machine; Communication; Component; and Deployment diagrams. It includes UML Class diagram editing for Java, *Enterprise Java Beans* (EJBs) and database objects, as well as an IE and IDEF1X editor for database objects (see Chapter 6). Added support includes UML Sequence diagram editing for Java; and Java method body visualization using *UML 2 Sequence* diagrams. IBM added support for C and C++ development via the Eclipse C/C++ Development Tool (CDT), which included: UML Class diagram editing for C++; and use of transformations to generate Java, C++ or EJB code.

Other features of Rational Software Architect include: traceability links from requirements through to implementation; automatic detection of patterns and anti-patterns – to reverse engineer existing code and graphically render application patterns and anti-pattern errors; template-based rules for monitoring and enforcing application structure; together with an enterprise-class IDE powered by Eclipse technology.

Rational Software Architect includes: Web Services and Service-Oriented Architectures that are *Web Services–Interoperability* (WS-I) compliant; automated tools for coding standards enforcement, for component testing of Java, EJB and Web Services, and for multi-tier runtime analysis; built-in Crystal Reports tools; RUP (*Rational Unified Process*) for dynamic guidance and user assistance; and the ability to generate HTML, PDF and XML reports from UML designs.

Further details and features provided by *Rational Software Architect* – and the subset support provided by *Rational Software Modeler* – are available from the earlier footnote links.

In Chapter 14 we saw that IBM provides full J2EE support for BPEL generation and execution from process models with *IBM WebSphere Business Integration Server Foundation* (WBISF) [f], a follow-on product to *WebSphere Application Server Enterprise*. In that chapter we saw that it is used in conjunction with *WebSphere Studio Application Developer (AD) Integration Edition* to build and deploy BPEL processes with a run-time environment for BPEL execution. These products run on Windows, Linux, IBM z/OS and OS/400 for execution.

This is an indication that future releases of *Rational Software Architect* and *Rational Software Modeler* may also include a BPEL code generation capability from process models as we discussed in Chapter 14.

With its focus on Software Architects with UML and code generation, IBM addresses the Zachman Framework *System, Technology and Component* (Designer, Builder and Sub-Contractor) rows. The other modeling tool vendors that we will discuss – Popkin Software and Visible Systems Corporation – also target their tools at these rows, but additionally address the *Scope and Business* (Planner and Owner) rows as well.

^f The announcement “*IBM WebSphere Business Integration Server Foundation, V5.1 — for building and deploying service-oriented applications*” is at <http://www-01.ibm.com/software/integration/wbisf/>.

Popkin (IBM Rational) System Architect

Popkin Software Inc was established in 1986. It was headquartered in New York, with *its Government Division in Washington DC. Its flagship product was System Architect*, a well-respected modeling tool.

System Architect [g] provides extensive support for business process modeling, object-oriented and component modeling with UML, relational data modeling, and structured analysis and design.

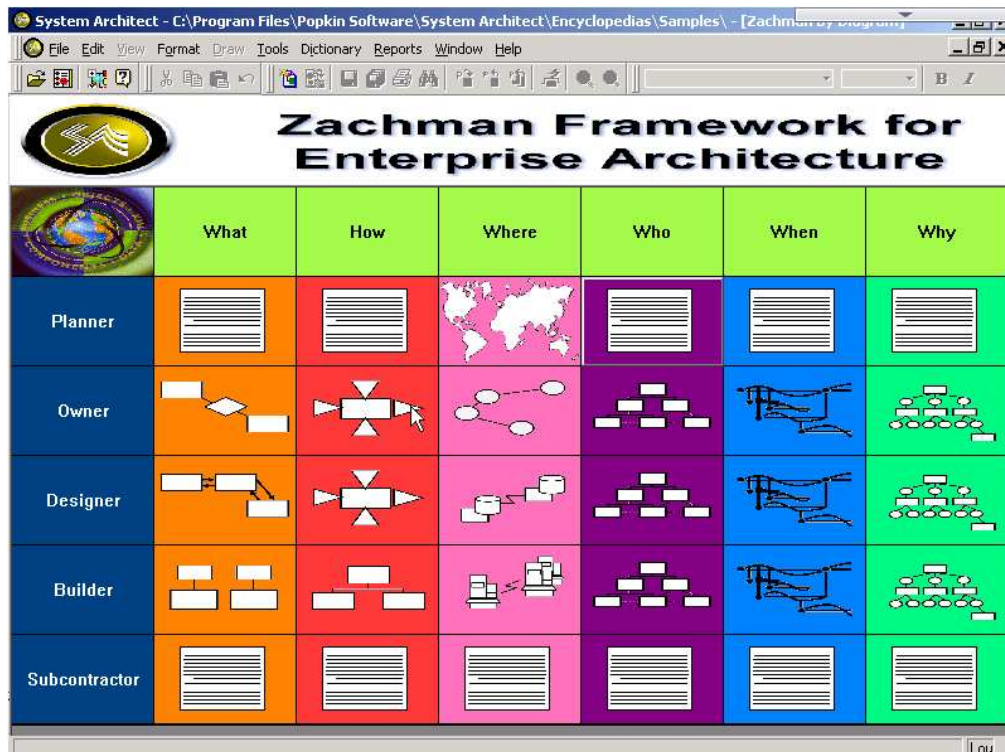


Figure P15.1: Zachman Framework Interface to System Architect (© 2004 Popkin, now IBM. [Reprinted with Permission])

It provides good support for Enterprise Architecture based on the Zachman Framework: for the DoD Architecture Framework (DoDAF); and the Federal Enterprise Architecture Framework (FEAF). These Defense and Government frameworks were covered in Chapter 5. A Framework Manager is also included with System Architect, which enables it to be tailored to support a wide range of Framework formats. *System Architect* is available in single-user and multi-user versions.

For example, *System Architect* with the DoDAF Option provides excellent modeling tool support for the model diagrams that represent the product

⁹ Telelogic purchased Popkin Software in 2005 and IBM completed its purchase of Telelogic in 2008. Extensive details of *Telelogic System Architect* and its add-on products, as well as tutorial demos and downloads are available from the IBM web site at <http://www-01.ibm.com/software/rational/support/telelogic/>. The product is now called *IBM Rational System Architect*.

deliverables for DoDAF. We discussed these deliverables in conjunction with Table 5.1 of Chapter 5.

Integrated Reference Model Architect (iRMA) is an add-on product for *System Architect* that is used with the *FEAF Reference Models* that have been published by the OMB (*Office of Management and Budget*). The *FEA Reference Models* were also discussed earlier, in Chapter 5 [h].

System Architect provides other capabilities as add-on products, such as *SA Simulator II* for simulating and qualifying process flows. We saw in Chapter 14 that a simulation capability is important to test and optimize process models for accuracy, efficiency and cost-effectiveness.

SA Compare is used to compare the contents of two *System Architect* repositories, while *SA Information Web Publisher* is used to build, deploy and maintain a content-rich web site automatically, for easy access to the models and data held in the System Architect repository.

The add-on product: *XML Architect* is used to define, maintain and generate XML data as Document Type Definitions (DTDs) and BizTalk schemas (see Chapter 11). It uses the *OMG XML Metadata Interchange* (XMI) standard to import and export metadata between System Architect and other modeling tools, including Rational Rose. The *Popkin Model Agency* is also used to make available pre-built models from other organizations that can be used to jumpstart a development project or to fast-start Enterprise Architecture.

The strength of *IBM Rational System Architect* is its excellent modeling capability and support for the Zachman Framework *System, Technology* and *Component* (Designer, Builder and Sub-Contractor) rows. With support for Requirements Analysis and Matrices, it offers some strategic planning capability that is essential for the *Scope* and *Business* (Planner and Owner) rows. But it excels in additional support for the rapid delivery technologies that we discussed in Part III. Its ability to publish models to the web for universal access via an enterprise's intranet keeps the number of licenses that are needed to a minimum.

In Chapter 10 and Chapter 14 we discussed that *Business Process Modeling Notation* is emerging as a standard for documenting process models. BPMN enables process models to be used to generate XML-based executable code for BPM languages such as BPEL and BPML, which we discussed in Chapter 14.

IBM Rational System Architect has offered support for BPMN from Version 9.0 (when it was part of Popkin), where it also established a partnership with Intalio for the generation of BPML [i]. We earlier discussed Intalio and its support for *Telelogic System Architect* in Chapter 14. Support for automatic generation of BPEL code was added to System Architect in Version 10.0, together with an

^h Details of the Federal Enterprise Architecture Reference Models were available from the FEA Program Management Office at <http://www.feapmo.gov/>, but now located at <http://www.egov.gov/>.

ⁱ Two White Papers were available from the Popkin web site: "BPMN and Business Process Management" and "Mapping BPMN to the Department of Defense Architecture Framework (DoDAF)".

ability to use SA Simulator II to test and optimize BPMN processes for accuracy, efficiency and cost-effectiveness. An excellent White Paper from Popkin discussed the mapping of BPMN to DoDAF [j].

With support for BPMN, its integration with SA Simulator II, and its support for BPEL and BPML code generation, System Architect is the first modeling tool to provide integration between models developed using the semantic methods from Parts II and I with the rapid-delivery technologies and BPM languages discussed in Part III. This is a direction that most modeling tools are expected to take in the coming years.

Proforma ProVision

The ProVision modeling tool from Metastorm provides extensive support for enterprise architecture frameworks, including Zachman, DoDAF and FEAF (See Chapter 5). It supports model-diagramming support for process modeling, workflow modeling, activity based costing (see Chapter 8) and the *Unified Modeling Language* (UML). It has extended this process focus with a process simulation capability and with a BPMN diagramming capability for workflow models [k]. ProVision includes the following products:

ProVision Enterprise: Enterprise modeling software for understanding and optimizing both business and IT, ProVision's web-based integrated repository of business processes and supporting systems and technology components provide frameworks to understand, analyze and improve all dimensions of the enterprise – who, what, why, where, when and how. When these enterprise concepts are understood and modeled, they collectively represent the architecture, or framework, for the organization, operation, and decision-making of an enterprise. It includes the following capabilities:

- Streamline processes to gain organizational efficiencies
- Perform “what if” analyses
- Improve your processes with Monte Carlo and Discrete Event simulators
- Identify opportunities for process improvement quickly
- Define strategy, goals, metrics, problems and implementation opportunities
- Quickly analyze the impact of process and system changes on data usage
- Provide clear definitions of system requirements using UML modelers
- Build systems that reflect business objectives and goals
- Manage requirements for complex system implementations
- Manage an enterprise's business and system knowledge

^j See the Wikipedia entry for Popkin System Architect at [http://en.wikipedia.org/wiki/System_Architect_\(software\)](http://en.wikipedia.org/wiki/System_Architect_(software)).

^k Metastorm has information on ProVision at http://www.metastorm.com/products/overview_index.asp.

- Communicate with anyone, anywhere, anytime via a web-server-based repository
- Produce high-quality documentation with on-demand web publishing facilities
- Interface with popular tools (Visio, Rational, ERwin, Microsoft and XML)
- Customize your modeling language (Rummler-Brache, DoDAF and UML)

Pro Vision BPMx (Business Process Management Xcellerator): This is an addition to the Pro Vision Modeling Suite, designed to provide the foundation for all process improvement initiatives and accelerate BPM implementation. It offers the following capabilities:

- Analyze how processes support and are influenced by corporate strategy and goals
- Understand organizational interactions and design efficient processes that maximize organizational resources
- Analyze process performance via Monte Carlo and Discrete Event simulators
- Perform "as is" and "to be" analysis to quantify and compare potential for increased service levels as well as time, error and cost reductions
- Manage and integrate processes and related components into a single web-based repository, accessible to the entire organization
- Pro Vision's *Common Interface Format* (CIF), supported by a consortium of leading BPMS providers, enables round-trip integration between *Business Process Analysis* (BPA) and *Business Process Management Systems* (BPMS) for a complete BPM solution (see Chapter 14)
- Robust interfaces to BPEL, ERP application, XML and Workflow engines

IDS Scheer ARIS

The ARIS modeling tool from the European company IDS Scheer offers modeling tool support for Enterprise Architecture, with support for the following products in the ARIS Platform [1]:

- **ARIS BSC:** Support for *Strategy Management and Balanced Scorecard* (BSC – see Chapter 2)

¹ A White Paper is available from http://lei.fpf.slu.cz/arissoubory/method_manual_aris_s.pdf.

- **ARIS Business Optimizer:** Analyzing performance indicators of process management structures, running what-if scenarios to generate transparency, identifying best practices
- **ARIS Business Architect:** Web Based Enterprise Architecture and Business Process Management
- **ARIS Business Designer:** Web based entry to professional business process management
- **ARIS Toolset:** Designing, analyzing and optimizing business processes
- **ARIS Simulation:** Simulating, analyzing and optimizing business processes
- **ARIS Business Publisher:** Dynamic publishing of process portals
- **ARIS Web Publisher:** Web-based communication of business processes
- **ARIS Quality Management Scout:** Establishment and operation of a process-oriented quality management system
- **ARIS for SAP NetWeaver:** *Business Process Management* solution for SAP NetWeaver (see Chapter 14) and mySAP solutions (co-developed with SAP)
- **ARIS UML Designer:** Business driven software engineering
- **ARIS P2A (Processes to Applications):** Complete implementation of business logic in executable applications
- **ARIS Software Engineering Scout:** Link between the process-oriented description of Technical requirements and the object-oriented design of applications in UML
- **ARIS Process Performance Manager:** Automatic analysis and visualization of actual processes
- **ARIS Audit Manager:** Operative audit workflow system for compliance with a wide range of ethical and statutory standards within a company, such as Sarbanes-Oxley Act (see Chapter 4), Basel II etc
- **ARIS Process Risk Scout:** Setting up and operating a operational risk management system

Visible Products

Visible Systems Corporation was established in 1984 and was one of the first companies to offer modeling tools to support systems development. Its headquarters are located in Framingham MA, near Boston. It offers an extensive range of products: from modeling tools (*Visible Analyst* and *Visible Advantage*);

to code generation (*Visible Developer*); and version control and configuration management (*Visible Polaris*, *LCSIS* and *Razor*) [m].

Visible Analyst

Visible's flagship modeling tool is *Visible Analyst Zachman Enterprise Workbench*, shown in Figure P15.2 [n]. This uses the Zachman Framework as an interface (similar to *IBM Rational System Architect*).

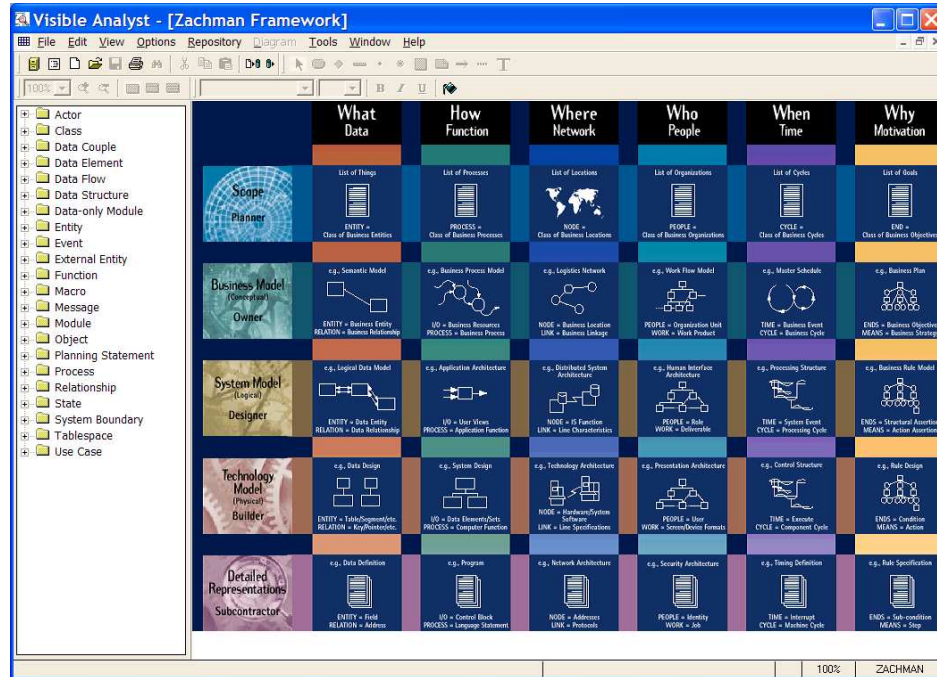


Figure P15.2: Visible Analyst Zachman Enterprise Workbench (© 2011 Visible. [Reprinted with Permission])

The *Visible Analyst Zachman Enterprise Workbench* includes support for: strategic planning; data modeling (E/R, IE, IDEF1X; object-oriented UML modeling; and process modeling (SSADM and all software engineering variants).

Each of the cells of the Zachman Framework interface in Figure P15.2 is clickable, offering direct access to all of the model artifacts that have been assigned to that cell. Any diagram format for various methods can be assigned to any cell through an extensible Framework Manager, or you can design your own diagrams based on a wide range of supplied icons. Frameworks supporting DoDAF, as well as FEAF, can be utilized – similar to what was discussed for *IBM Rational System Architect*.

Visible Analyst is available in several editions that support different methodologies. These are: the Corporate Edition (with support for all of the

^m Details of *Visible Analyst*, *Visible Advantage*, *Visible Developer* and other products in this section are available from the Visible Systems Corporation web site at <http://www.visible.com/>.

ⁿ *Visible Analyst* details are available from <http://www.visible.com/>. Click on the *Products* link.

above methodologies); and the Zachman Enterprise Workbench in Figure P15.2 (which adds support for the Zachman Framework to the Corporate Edition). All editions offer single-user and multi-user support.

Visible Analyst can run concurrently with *Microsoft Visual Studio.Net* (see Chapter 13). Developers using .Net thus have immediate access to UML, Software Engineering and the database development capabilities of *Visible Analyst* while also working with *Visual Studio*.

Visible Analyst can be used for forward and reverse engineering for a wide range of RDBMS products, with support for multiple versions of each DBMS. It provides reverse engineering of metadata from COBOL source code with the *Visible Application Browser*. This extracts critical information regarding data and process flows of COBOL legacy systems and stores this as a model in the repository of *Visible Analyst* [o].

It supports the automatic generation of *XML Document Type Definitions* (DTDs) and *XML Schema Definitions* (XSDs) using the same metadata as used for the automatic DDL generation of RDBMS products. This enables XML to be used as a DBMS format, with native XML database support now available from many RDBMS vendors. *Visible Analyst* includes direct support for import / export between many other modeling tools (including *Rational Rose*, *IBM Rational System Architect* and *CA ERWin*), plus XMI import and export.

The *Zachman Enterprise Workbench* can include the *Visible Business Templates*. These are based on a *Universal Data Model* of common functions and databases drawn from a large number of projects across many industries. It contains over 600 entities and 1,000 attributes for more than 50 major Business Objects. This provides a fast-start capability for Enterprise Architecture, with 12 to 18 months of development work already defined, ready to be tailored using *Visible Analyst* to your specific terminology and your corporate requirements.

Based on a current need for code generation for languages such as *Visual Basic* (VB) and *Active Server Pages* (ASP) and for *VB.Net*, *ASP.Net* and *C#.Net* for *Microsoft Visual Studio*, Visible first focused their R&D resources on *Visible Developer* (discussed shortly). We discussed in Chapters 14 and 15 the use of *Business Process Modeling Notation* (BPMN) by modeling tools for automatic generation of BPEL and BPML XML-based executable code as a part of systems development. *Visible Analyst* also includes BPMN support for development of *Business Process Diagrams* (BPDs).

With support for strategic planning, *Visible Analyst* provides excellent modeling capability not only for the Zachman Framework *System*, *Technology* and *Component* (Designer, Builder and Sub-Contractor) rows but also for the *Scope* and *Business* (Planner and Owner) rows. It offers import and export between *Visible Analyst* and Visible's other modeling tool: *Visible Advantage*.

o The *Visible Application Browser for COBOL* provides reverse engineering of metadata from COBOL source code at <http://www.visible.com/>.

Visible Advantage

Visible Advantage adds rapid-delivery methodology and modeling support for the Zachman *Scope* and *Business* (Planner and Owner) rows, with automatic DDL generation support for Col 1 (What), (Designer, Builder and Sub-Contractor) rows and support for the *Scope* and *Business* (Planner and Owner) rows for Col 2 (How) [p]. This includes full support for most of the methods discussed in Parts II and I: strategic planning (see Chapter 3); data modeling (IE and IDEF1X – see Chapters 6 and 9); activity modeling (IDEF0 – see Chapter 8) and Process Modeling (see Chapter 10). However it does not support BPMN. Instead *Visible Analyst* is used for BPMN – with import from *Visible Advantage* of its associated data models and strategic plans.

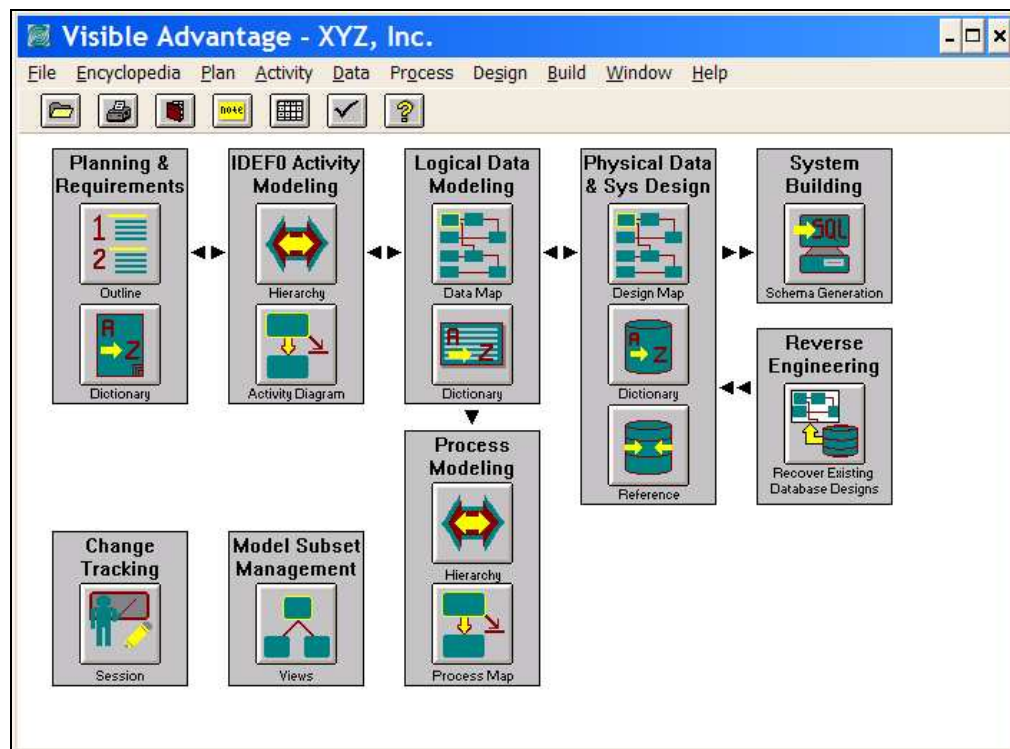


Figure P15.3: Visible Advantage Enterprise Architecture Edition (© 2001 Visible. [Reprinted with Permission])

Visible Advantage is available in two editions: the *Data Warehousing Edition* and the *Enterprise Architecture Edition* (see Figure P15.3). Both of these editions offer single-user and multi-user support capability.

The *Visible Business Templates* are also available for use with *Visible Advantage*, which was used for their initial development. At that time they were called the *Visible Universal Data Model*. These templates were migrated also to *Visible Analyst*, as discussed earlier.

^p Visible Advantage details are available from <http://www.visible.com/>. Click on the *Products* link.

Visible Advantage includes *Active Matrix* capabilities for automatic generation of strategic alignment matrices as discussed in Chapter 8 and for the Governance Analysis matrices in Chapter 4. Matrices can be generated dynamically to show the relationships that exist between any two columns of the Zachman Framework, across any row. Clicking on any cell in the generated matrix dynamically creates bi-directional links in the encyclopedia (repository) for the relevant matrix rows and columns (see populated matrix examples in Figure 8.3 and Figure 4.4 – Figure 4.7).

At the time of writing the first edition of this book, *Visible Advantage* was the only modeling tool on the market that offered full automatic generation support for *entity dependency analysis*, as discussed in Chapter 7. We saw how this enables priority clusters to be derived from data models in Col 1 (What), *Business* (Owner) Row 2 (How) or for logical data models in Col 1, *System* (Designer) Row 3 as “*vertical slivers*” for rapid delivery in 3 month increments (see Figure 1.7). With the publication of the second edition of the book, this automatic generation support for *entity dependency analysis* is now also provided by another modeling tool, Sparx Systems *Enterprise Architect* (see shortly).

Visible Advantage automatically derives project plans from data models (using the methods described in Chapter 7) and automatically generates an *enterprise architecture portfolio plan* (EAPP) Report. An example of a Cluster Report for the sample solutions in Chapter 7 is included as Report S7.1 [q]. Full document publication capability is provided for automatic production of all Appendix Reports for the EAPP Report from the models captured in the *Visible Advantage* encyclopedia.

Visible Advantage provides forward and reverse engineering capabilities, with automatic DDL generation capability, for the major RDBMS products. It offers automatic generation of XML DTDs and DCDs (*Document Content Descriptions* – an earlier XML definition format used by Excelon). Its scripting language allows easy tailoring of the specific DDL syntax required by any DBMS or XML database format. It offers comprehensive extensibility features. Its drop-down option lists can be easily tailored to your own terminology, with custom-fields added to dialog boxes for all definitions, as required.

A check-in/checkout capability for single-user versions is used for the administration of concurrently developed and managed models. A *Compare-Merge* facility compares two encyclopedias and merges changes automatically back into the master encyclopedia based on your specifications. For multi-user versions, all model changes are dynamically applied to all relevant windows that are currently open – anywhere on the network, worldwide. This ensures that all concurrently working project teams are instantly aware of the latest changes that have been made to the multi-user encyclopedia. For both single-user and multi-user operation, if any changes need to be made to models outside the ownership of a project team, electronic “sticky notes” can also be attached to any model artifact detailing the changes requested by that project team.

^q This is in the file: “*Chap-07-Solutions.pdf*” at http://www.ies.aust.com/EA_Book/Chap-07-Solutions.pdf.

Visible Developer

Visible claims that *Visible Developer* automatically generates >80% of program code (of that previously all written by hand) directly from database code patterns. This is based on the concepts of code generation discussed for process modeling in Chapter 10. These database code patterns are automatically generated when DDL is imported from *Visible Analyst* or *Visible Advantage*. Or alternatively database code patterns can be reverse engineered from any DBMS that has an ADO or ODBC interface to the SQL catalog of existing databases. Changes made directly within *Visible Developer* are incorporated back into *Visible Analyst* as appropriate, for round-trip engineering.

Visible Developer can be installed as an add-in to *Visual Basic 6.0* or later to generate code in Visual Basic or ASP. It can also be installed for use with *Microsoft Visual Studio* (see Chapter 13). Known as *Visible Developer.Net* when installed for use with this IDE, it is used for code generation of *Visual Basic.Net*, *ASP.Net* and *C#.Net*. The Visible website provides an online demonstration of code generation for these environments [r].

Business objects are generated from the DDL that is imported for each database table. Standard methods for Add, Delete, Update and Search are generated for each business object represented by a database table. Dynamic SQL and stored procedures can be optionally generated for standard methods. User-defined methods can also be added. All methods are implemented as transactions, with full support for database commits and rollbacks.

Several default rules are also added automatically for each database object. Rules are defined as design-time and run-time objects. Dependencies between rules and methods can be defined: a method cannot execute unless all rules associated with it are true.

Clear edit points are provided in the program code that is generated so that the remaining 10%–20% of logic that is application-specific can be easily added. Any change in the database structure that is subsequently made enables the database code pattern logic to be automatically regenerated, preserving the application-specific code without requiring further change.

The generated application code is high-quality 3-tier logic. Three generated projects each represent a layer in the 3-tier design model as follows:

- *Layer 1* – the user interface (UI) – contains forms that use the business objects in Layer 2 to create, read, modify and delete business data. An ASP front end can be generated for VB6 applications, or an ASP.Net front end for VB.Net applications.
- *Layer 2* – the logical layer – contains classes that present business data to the user interface in Layer 1, validate the data that is received from the user interface, and also execute business rules.

^r A demonstration of code generation in Visual Basic, ASP, Visual Basic .Net, ASP .Net or C# .Net is available from <http://www.visible.com/>.

- *Layer 3* – the persistence layer – contains classes that interact with the objects that exist as tables in the database.

The generated code is modular, well documented, and incorporates the best design and programming practices. Maintenance is easier: the generated code is consistent; and all business objects have the same design, behavior and naming conventions. All application-specific logic resides between clearly marked edit points so that application-specific code is preserved when the application is regenerated.

With automatic code generation in various languages as discussed above, the remaining area for software product support is version control and configuration management.

Visible Version Control and Configuration Management

Visible offers several products for version control, workflow, problem and issue tracking, product data management and software configuration control. These products are: *Visible Polaris*, *LCSIS* and *Razor*.

Visible Polaris is a version-control, problem-tracking and defect-management tool for use with Microsoft Windows. With support for Issue and Problem Tracking, plus Process and Workflow Management, it is customizable and can be installed for use with *Visual Studio*, with links to your version control provider. Any provider, such as *Visible Razor*, that supports the Microsoft SCC interface can be used. *Visible Polaris* is used for automatic requirements management with *Visible Analyst*, tracking a series of tasks for particular requirements through design and development activities within Analyst.

Visible LCSIS is a data management tool that is designed to meet the specialized needs of product development. It offers comprehensive product data structure, workflow task processing, communication links, data vaulting and access control, all in an interactive network environment to help meet industry standards requirements such as ISO 9000.

Visible Razor is a software configuration management system for process management, problem and issue tracking, version control, and release management that runs under Unix or Linux. Workflow, templates, rules and controls can be customized to meet your needs. The Razor tools can be used collectively as a tool suite or independently, as all tools share a common database.

Further details on each component of this family of *Version Control and Configuration Management* tools are available from the footnotes [s].

^s *Visible Polaris*, *LCSIS* and *Razor* details are available from <http://www.visible.com/>. Click on the *Products* link.

Sparx Systems

Enterprise Architect [t] has been developed by Sparx Systems in Australia. It provides extensive EA capability for \$US200-\$US300. It supports UML 2.3 and from V7.0 also supports *Business Process Modeling Notation* (BPMN).

Enterprise Architect (EA)

First released in 2000, EA has evolved over the years and has acquired a well-earned reputation as a UML-based CASE tool with over 200,000 users worldwide. Its name has always worried me: I felt that it should have been called “UML Architect”, not “Enterprise Architect”. However, with the release of V7.0, it truly earned the right to use the name: *Enterprise Architect*.

My first introduction to Sparx Systems was through their Chief Operating Officer, Ben Constable, who attended a workshop that I presented in Sydney in late 2006: “*Rapid Delivery of Enterprise Architecture*”. This course provides skills-transfer in methods and technologies for rapid delivery of Enterprise Architecture in 3-month increments, as described in this book.

Ben Constable approached me during the course to discuss whether and how these rapid delivery methods could be incorporated into EA. I told him that Chapter 7 of the book was written specifically so that users could learn how to apply the rapid delivery methods manually; it was also written so that developers could automate these methods and incorporate them into modeling tools. From that discussion Sparx engaged me as a Consultant to advise their developers over a 1-week assignment in Jan 2007. I found their developers were very bright and eager to learn these rapid delivery methods.

Sparx added extensions – as an Add-In to V7.0 – to provide a clickable front-end interface using the Zachman Framework for Enterprise Architecture (see Figure P15.4). This interface is based on V1.0 of the Zachman Framework (see Chapter 1).

They added support to derive project plans automatically from data models and also to derive project maps, based on Chapter 7 of my book. These capabilities are essential, if a modeling tool is to be able to identify reusable processes as subprojects for early 3-monthly deliveries into production as databases and systems. As this development moved to a Beta release I tested what they had implemented: called the “MDG ZF Add-In” (formally named the “*MDG Technology for Zachman Framework*”) [u].

My first experience with EA, I must admit, was one of confusion. This is such a comprehensive product that it was hard to know where and how to start. However after some prompting from Sparx Systems I located an introductory video on their web site, which got me started. Make no mistake, its low price: \$US200 - \$US300 per user depending on license usage led me at first to suspect

^t Enterprise Architect can be downloaded from <http://www.sparxsystems.com.au/>.

^u At the time of writing, the current version of Enterprise Architect is V12.0.

that it was not a full-featured Enterprise Architecture product. How wrong was I in this assumption: it is one of the most complete, fully featured yet easy-to-use products that I have ever encountered!

EA supports all 13 UML 2.1 diagrams, including UML Class Diagrams and support for IE and IDEF1x data modeling notations plus DDL generation for DB2, InterBase, Informix, Ingres, MS Access, MySQL, Oracle 9i and 10g, PostgreSQL, Microsoft SQL Server 2000 and 2005, SQL Server 7, Sybase Adaptive Server Anywhere and Sybase Adaptive Server Enterprise. It reverse-engineers from any ODBC database.

EA can connect to database repositories on SQL Server 2000 and 2005, MySQL, Oracle9i and 10g, MS Access, PostgreSQL, Adaptive Server Anywhere, MSDE Server or Progress OpenEdge. It includes built-in support for Requirements Management and for Project Management with support for resources, metrics and testing. It generates HTML and Rich-Text (RTF) comprehensive documentation. It generates and reverse engineers code in a number of languages including C, C++, C#, Delphi, Java, PHP, Python, Visual Basic and VB.NET.

EA derives Cluster Reports automatically, as shown in Figure P15.6, which was derived from the Conceptual Data Model in Figure P15.5. Model-Driven Architecture (MDA) transforms are provided by EA, according to Sparx as follows:

“(EA) provides a fully configurable method of converting model elements and model fragments from one domain to another. This typically involves converting Platform-Independent Model (PIM) elements to Platform-Specific Model (PSM) elements. A single element from the PIM could be responsible for creating multiple PSM elements across multiple domains.

Transformations are a huge productivity boost, and reduce the need to manually implement stock classes and elements for a particular implementation domain; for example, database tables can be automatically derived from persistent PIM classes. Enterprise Architect includes some basic built-in transformations, such as PIM to Data Model, PIM to C#, PIM to Java and PIM to XSD.”

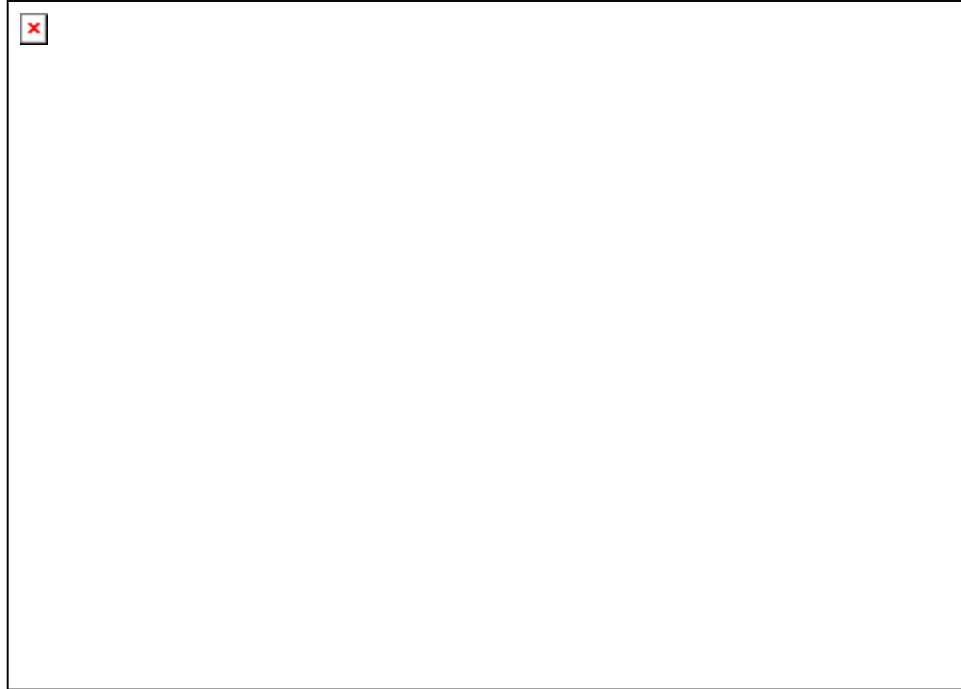


Figure P15.4: The Zachman Interface to Enterprise Architect V7.0+ (© 2007 Sparx Systems. [Reprinted with Permission])

EA also derives Project Maps (which Sparx call Process Maps) automatically, as shown in Figure P15.7 for the Conceptual Data Model in Figure P15.5 and the Cluster Report in Figure P15.6.

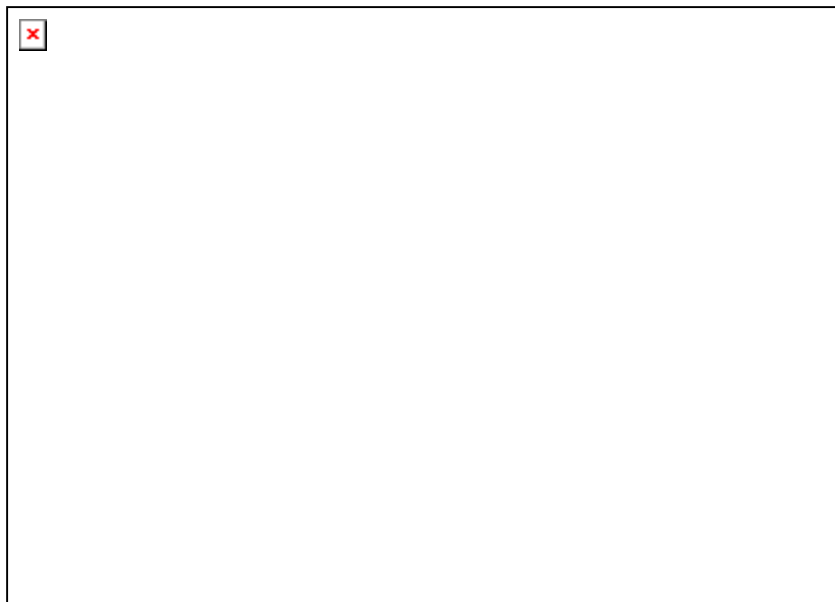


Figure P15.5: Conceptual Data Model developed with Enterprise Architect, using IE Notation (© 2007 Sparx Systems. [Reprinted with Permission])

Model-Driven Generation (MDG) technology enables Sparx Systems to extend EA's core functionality. This has been used in V7.0 to add: built-in support

for *Business Process Modeling Notation*; and support for the clickable front-end interface using the Zachman Framework for Enterprise Architecture (as the ZF Add-In, see Figure P15.4) which includes automatic derivation of project plans and reusable processes from data models for early delivery of priority processes into production in 3-month increments. MDG add-ins are also supplied for Visual Studio and Eclipse. These enable Enterprise Architect to interoperate with the Microsoft® Visual Studio® and Eclipse IDEs respectively.

“MDG Integration for Visual Studio 2013 tightly integrates Enterprise Architect into the Microsoft® Visual Studio® development environment. This product enables users to explore and edit the UML model inside Visual Studio and also provides many of the key features of Enterprise Architect directly within the IDE, including rich text and web-based document generation, MDA transformations, Baseline management and Engineering of key XML-based technologies.”

EA has the ability to easily add new diagramming approaches and icons. For example, support is included for documenting Mind Maps and also Strategy Maps (used with Balanced Scorecard) – see Chapter 2. The latter is not normally supported by modeling tools, yet is useful to provide effective support for requirements based on Strategic Business Plans.

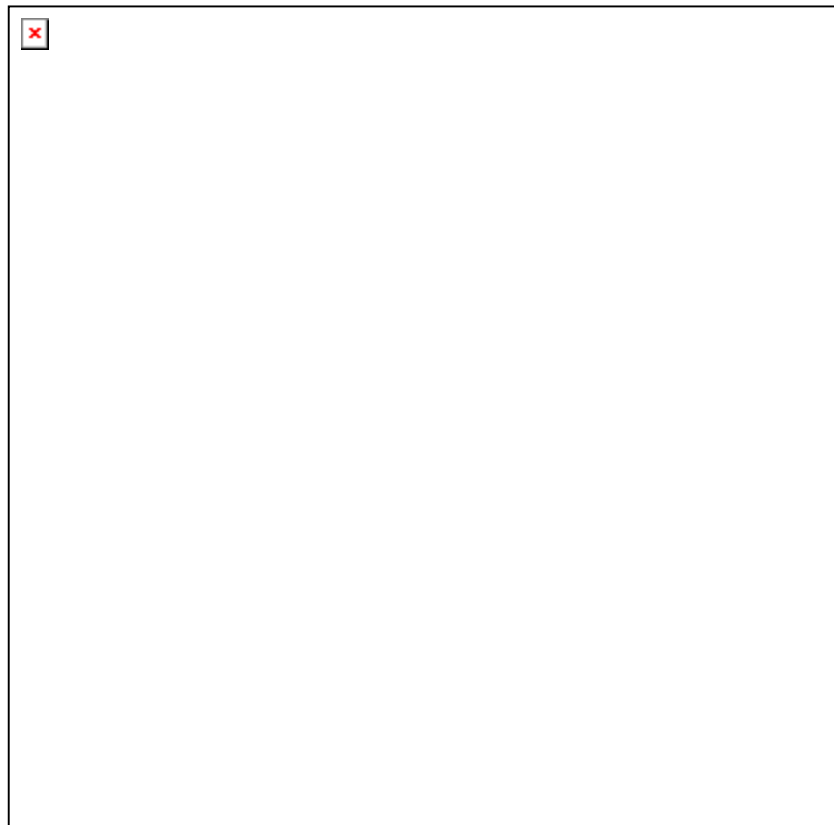


Figure P15.6: Derived Cluster Report by Enterprise Architect (© 2007 Sparx Systems. [Reprinted with Permission])

Enterprise Architect supports version control of packages and their component sub-packages to a central repository. This repository is maintained by third-party version control applications that control access and record revisions.

Enterprise Architect ships with several predefined Model Patterns to assist in the creation of new projects and models. Each pattern contains notes, references and starter elements that together provide a framework on which you can build your own model. The User Interface for EA includes:

“The Project Browser, which displays the complete contents of a model or project in a hierarchical format. This enables you to add, select, reorganize or delete packages, diagrams and elements anywhere in the project; The Toolbar, which is context-sensitive to the diagram being created, provides a quick and efficient means of selecting and creating the appropriate model elements or connectors, whether they be UML, from extended diagrams or from imported technologies; the Diagram View, which enables you to display and develop diagrams selected from the Project Browser. Diagram backgrounds, connectors and elements can be colored with or without a color gradient for color-coding or for better display and presentation; context menus, which provide options specific to the type of object and its immediate environment.”

Enterprise Architect enables fast editing of element properties directly from the diagram. Using in-place edit commands, you can rapidly add and update element features such as attributes, operations and parameters, all without leaving the Diagram View.



Figure P15.7: Derived Project Map using Enterprise Architect (© 2007 Sparx Systems. [Reprinted with Permission])

A Quick Linking capability provides a fast and ‘in-place’ mechanism for creating new elements and connectors on a diagram. Its context-sensitive selection menus help guide creation of “correct” models, saving users’ time and improving overall productivity. In addition, Sparx claims that:

“You can export diagrams to a range of image formats (.bmp, .jpg, .png, .gif, .emf and .wmf); swim-lanes enable logical partitioning of diagrams; the Pan & Zoom window enables easy navigation and preview of complex diagrams; you can lock down diagrams to prevent accidental modification; Enterprise Architect Shape Scripts enable you to specify custom shapes via a scripting language, each shape being keyed to a stereotype; these custom shapes are drawn instead of the standard UML notation for every element of the same stereotype; you can also superimpose alternative images – as metafiles - on diagrams and elements, to replace the standard image.” This latter capability enables the “stick-figures” and other icons of UML Use Case diagrams (for example) to be replaced by more business-oriented images.

Enterprise Architect’s Auditing feature enables you to track and record changes made to the model over time. By using this option, model administrators can view a range of information regarding changes, such as: *“who changed an element; how many elements they changed; when they changed the data; what the previous values were, and what type of elements they changed.”*

The Relationship Matrix enables you to study the relationships between model elements in a tabular view. It also enables you to create, modify and delete relationships between elements with a single mouse click.

The production of documentation is essential to realizing the full benefit of any modeling tool. Enterprise Architect outputs high quality documentation in either RTF or HTML format, as follows:

“You can modify RTF formatting directly with RTF Style templates to alter the look and feel of generated output. Using MS Word you can further enhance the output by connecting and interweaving model output in linked documents. There are many ways to specify the Enterprise Architect content being documented. You can: document a package and/or its child packages by manually highlighting the package and selecting a documentation control; specify embedded packages for exclusion if child packages are recursively documented; link a package to an RTF document template to simplify generating consistent types of documentation (such as Use Case reports) using the Documents feature.”

You can select, group and order packages together in a manner different from the project view by creating “virtual” documents. The RTF (Rich Text Format) Report Writer Style Template editor enables custom RTF templates to be created and edited to define any output RTF documentation:

“The Style Template Editor enables you to select particular model elements and then to specify, from the element type, the fields for inclusion in the generated document. Formatting styles can be defined in the Style Editor, and items such as tables of contents and headers can be added to the document.”

“Enterprise Architect enables you to export an entire model or a single branch of the model to HTML web pages using the HTML Report Writer. The HTML report provides an easy-to-use and highly detailed model tree. In addition, hyperlinked elements make browsing to related information very easy. The HTML documentation is based on user-customizable HTML templates, so you can tailor the generated web-pages to suit your company standard.”

Enterprise Architect enables you to link rich-text documents to any element in the model. Linked documents are created from customizable templates and are included in generated web and Word-based reports.

Enterprise Architect offers a diverse set of functionality designed specifically for sharing projects in team-based and distributed development environments. Projects can be shared through network deployment of model repositories, replication, XMI Import/Export, Version Control, Package Control and User Security.

Network deployment can be achieved with an EAP (file based) repository or by using a dedicated DBMS (server based) repository. The Corporate Edition of Enterprise Architect supports large projects and many concurrent users. It *“enables the use of database repositories rather than use the standard .EAP files to store model data. Enterprise Architect supports the following DBMS repositories: “Microsoft SQL Server; MySQL; Oracle; PostgreSQL; Progress OpenEdge; MSDE Server; Adaptive Server Anywhere.”*

The *XMI Import/Export* facility can be used to model discrete packages that can be exported and shared between developers. XMI enables packages to be exported into XML files that can then be imported into any model. Package control can be used to set up packages for version control and enables batch export of packages using XMI. Version Control enables a repository to be maintained by a third-party source code control application, which is used to control access and record revisions.

“Enterprise Architect supports version control of project root nodes, packages and their component sub-packages to a central repository. This repository is maintained by third-party version control applications that control access and record revisions. Version control products supported for Enterprise Architect include CVS, Subversion, Microsoft Team Foundation Server (TFS) and SCC-compliant tools (including Visual Source Safe and Clear Case).”

Enterprise Architect’s built-in Data Modeling profile extends UML to provide an intuitive mapping from the database concepts of tables and relationships onto the UML concepts of classes and associations. These extensions also enable you to model database keys, triggers, constraints, referential integrity and other relational database features. When modeling or designing databases you might typically: *“create a Data Model diagram; create a table; set properties of a table; create columns; create primary keys; create foreign keys; create stored procedures; create indexes, sequences, functions and triggers; generate DDL for a table; generate DDL for a package; convert data types for a table; convert data types for a package; customize data types for a DBMS; import a database schema from an ODBC data source; and create views.”*

At the time of writing, Sparx Systems Pty Ltd *Enterprise Architect* is at V12.0. This provides enhanced support for team development, and (from V9.0 in 2011) support for BPMN 2.0 and generation of BPEL from BPMN 2.0 diagrams. It includes support for Gap Analysis for TOGAF 9, with support for C# 4.0 and VB.Net 10.0 for code generation and reverse engineering. Also included is simulation support for UML *Activity*, *Interaction* and *State Machine* models plus numerous enhancements to project management, development, execution analysis, reporting and learning resources.

Free Student Editions of Modeling Tools

Most modeling tool vendor web sites offer evaluation versions of their products that can be downloaded free. However these evaluation versions typically have a 21-day or 30-day expiry period following their installation on your machine, after which time the tool cannot be used or installed again unless it is purchased. This is not very useful if you want to continue to utilize a modeling tool in conjunction with this book.

As discussed in the Preface in the section: *Free Use of Modeling Tools*, Visible Systems Corporation have provided four of their modeling, code generation and change management tools, discussed earlier, free – for your use with this book. These are: *Visible Advantage Enterprise Architecture Edition*; *Visible Analyst Enterprise Framework Edition*; *Visible Developer* and *Visible Polaris*.

Each of these software products can be downloaded as a free Student Edition. These are limited-capacity, single-user versions, which will not expire. They enable projects to be defined of a size sufficient to learn how to use each tool in conjunction with the methods and technologies discussed throughout the book.

Use the Authorization Code “991Student877” [v] to download Student Editions of these products. The Student Editions of these products are intended for use with the book as follows:

Visible Advantage Enterprise Architecture Edition: As discussed earlier, this supports: strategic planning; integrated logical and physical data modeling with automatic DDL generation; activity modeling; process modeling; and a concurrent relational multi-user repository. It supports model analysis validation and entity dependency analysis for automatic generation of Cluster Reports for *Enterprise Architecture Portfolio Plan* (EAPP) Report generation. With project examples from the book as used in Chapter 7, you can use this modeling tool particularly for Planning and Analysis tasks in the *Zachman Scope and Business* (Planner and Designer) rows for Enterprise Architecture.

Visible Analyst Enterprise Framework Edition: This Zachman Framework edition also includes support for Software Engineering and UML. It includes: strategic planning; structured analysis and design modeling; object-oriented modeling; BPMN support; data modeling and database design; and reverse engineering through SQL DDL capture. It includes business rule model validation and an integrated data repository. The Zachman Framework is used as an interface for better management of repository objects. You can use this modeling tool for Design and Development tasks in all rows of the Zachman Framework.

Visible Developer: This provides automatic code generation in Visual Basic, Visual Basic.Net, ASP, ASP.Net and C#.Net. It generates complete customizable, executable and layered applications. It can seamlessly connect your applications to multiple legacy databases. It deploys a common and consistent multi-tiered application framework. You can use this tool for Deployment tasks in the *System, Technology and Component* (Designer, Builder and Sub-contractor) rows of the Zachman Framework for Enterprise Architecture.

^v Visit Visible Systems Corporation at <http://www.visible.com/> and click on *Products*, then *Downloads*. Select the product you want, then enter your details and the Authorization Code: “991Student877” to download the relevant Student Edition.

Visible Polaris: This product is used for issues management, task management and overall project management for software development life cycle (SDLC) activities. It includes Task and Workflow Management with automated defect tracking and with consolidated project information in the form of bug tracking, defect tracking, issue tracking, problem tracking, and automated ticketing. It is easy to learn and use, and is configurable to your processes. It integrates with all Enterprise Architecture tasks (Planning, Analysis, Design, Development and Deployment). You can use this tool for Change Management tasks in all Zachman rows of Enterprise Architecture.

Review the instructions that detail the procedure to be followed to install the downloaded products for your student projects. Documentation and tutorials for each product are also included. The broad outline for your use of these tools follows:

1. I recommend that you first use *Visible Advantage* – in its Student Edition version – as you work through the book. You can use it to understand and apply each of the relevant methods covered in Parts I and II.

Your focus with *Visible Advantage* is to apply Enterprise Architecture methods for definition and analysis of Zachman *Scope* and *Business* (Planner and Owner) rows, to the point where high-level “horizontal slices” have been defined – as discussed in Chapter 5. You can analyze and document your evolving models, such as used in the Cluster Report in Chapter 7 [w] and various reports for other method chapters. The *Visible Advantage* encyclopedia used for the model examples discussed in the book can also be downloaded as a ZIP file [x].

2. You can later export models that you develop using *Visible Advantage* to *Visible Analyst*, where you can use the Zachman Framework to better understand the ramifications of the strategic work carried out with *Visible Advantage* in the *Scope* and *Business* (Planner and Owner) rows. The repository features in *Visible Analyst*, together with support for Software Engineering and UML, are well suited to advance this effort.
3. Once DDL scripts have been generated from *Visible Analyst* or *Visible Advantage*, *Visible Developer* can be used automatically to generate applications in Visual Basic, ASP, Visual Basic.Net, ASP.Net or C#.Net, as discussed earlier in this chapter.
4. Finally, *Visible Polaris* can be used to track changes throughout the entire Enterprise Architecture lifecycle.

^w See Report S7.1 in: “*Chap-07-Solutions.pdf*” at http://www.ies.aust.com/EA_Book/Chap-07-Solutions.pdf

^x Download the encyclopedia from http://www.ies.aust.com/EA_Book/Advantage_Encyclopedia.zip. Unzip this to the directory “SMEA”. Install it as a subdirectory under C:\iea73. Login to the SMEA project using SMEA as the user name, with no password.

Free Use of Modeling Tools for Full-Capacity Projects

As well as unlimited-time-usage of the above limited-capacity Student Editions, Visible has also provided you with a further capability that is extremely valuable:

Visible Analyst can be used in conjunction with one full-capacity project at no additional charge for 90 days. Visible Polaris can be used in conjunction with one full-capacity project at no additional charge for 30 days. These represent several thousand dollars value.

Visit the Visible Systems Corporation website [y] and enter the Authorization Code “816EA541” to download these full-capacity versions of *Visible Analyst* and *Visible Polaris*. Once you enter the supplied authorization code, that product can be downloaded and installed for full-capacity use for 90 days (for *Visible Analyst*) or for 30 days (for *Visible Polaris*) from the date of installation. At the end of that period, the product will cease to operate, but can be uninstalled and replaced by a purchased copy of the relevant product.

With this subsequent product purchase, you will be given a Registration Code that will enable the product to be used for any number of future full-capacity projects that you wish, without limit.

Only when you are familiar with the student edition of each product as discussed above should you consider using *Visible Analyst* or *Visible Polaris* in full-capacity projects. You will then have only 90 days (for *Visible Analyst*) or 30 days (for *Visible Polaris*) to complete these full-capacity projects before each product ceases to operate.

Web 2.0 and RIA Products

When it is time to deploy your developed models and applications, there are many technologies that are available. For example, Web 2.0 technologies that are based on *Asynchronous JavaScript and XML* (AJAX) are used to deliver a *Rich Internet Application* (RIA) user interface similar in performance to a desktop software interface. We will conclude this chapter by discussing some Web 2.0 and RIA products as listed below, followed by Cloud Computing and SaaS products:

- WaveMaker
- Iron Speed Designer
- Alpha Five
- Caspio
- Jackbe JackBuilder
- Adobe LiveCycle Designer

^y Visit Visible Systems Corporation at <http://www.visible.com/> and click on *Products*, then *Downloads*. Select the product you want, then enter your details and the Authorization Code: “816EA541” to download the relevant full capacity version of that product.

WaveMaker

WaveMaker is a rapid application development product for building *Rich Internet Applications*. It generates form and database access logic from database code patterns automatically, developed through a drag-and-drop environment. In fact, its visual, WYSIWYG development studio was built using WaveMaker. It can work directly from databases installed from DDL to generate forms to populate data. WaveMaker has good security control and clean forms design. An excellent video demo is available from their website [z]. They claim that:

“WaveMaker Studio generates standard Java apps - extensible by expert developers using any Java IDE. WaveMaker Enterprise Server uses standard Java components to provide security, data access & scalability.”

“One-click deployment eliminates the complexity of deploying web apps to enterprise or cloud-based hosting.” They claim that: *“WaveMaker Enterprise Server automatically provides the same multi-tenancy architecture as Salesforce.com.”* And that: *“WaveMaker is the only open source cloud development platform. Deploy to your choice of cloud hosts directly from the Studio: Amazon EC2, Rackspace, OpSource or Eucalyptus.”*

Furthermore, they state that: *“WaveMaker Studio will look and feel especially familiar to client/server developers who are used to working with visual tools like Microsoft Access. WaveMaker slashes the painful Java learning curve for developers who are familiar with tools like Microsoft .Net, Lotus Notes, Oracle Forms, PowerBuilder or ColdFusion.”*

“WaveMaker Studio is a visual, WYSIWYG development tool that runs in a standard browser. WaveMaker Enterprise Server is a standards-based Java server that runs WaveMaker applications.”

WaveMaker claims that it offers the following features:

- *“Drag and drop application assembly*
- *One-click database import*
- *One-click CRUD data forms*
- *One-click related data forms*
- *Live data preview within studio*
- *Single sign-on security (Enterprise Edition only)*
- *Role-based access controls (Enterprise Edition only)*
- *Rich entry field validation*
- *Built-in data grid pagination*
- *Auto-complete search boxes”*

^z Further WaveMaker details are at <http://www.wavemaker.com/>. The WaveMaker demonstration video is located at <http://www.wavemaker.com/screencasts/entertweet/entertweet.mp4>.

Iron Speed Designer

Iron Speed Designer [aa] builds data-driven Web 2.0 RIA .Net applications from database tables through drag-and-drop. A number of sample applications built using Iron Speed Designer can be viewed on their website [bb]. A number of White Papers are also available [cc]. For example, they précis the following:

"Build and Deploy Database Applications without Programming" tells the real story behind Iron Speed Designer — the events and real-world problems that led to its creation. Learn what application generation can do and the amazing ROI it delivers.

"Build Cloud Applications Without Hand-Coding" shows how Iron Speed Designer creates Software-as-a-Service (SaaS) applications and walks you through the process of customizing and deploying cloud applications.

"Build Web 2.0 Applications Without Hand-Coding" shows how Iron Speed Designer accelerates development by eliminating routine infrastructure programming, giving you Web 2.0 applications in minutes.

Alpha Five

Alpha Five [dd] is used to develop *Web 2.0 Rich Internet Applications* using Alpha Five's "CodeLess Ajax™" technology, but it does need some Javascript understanding and knowledge. Its website offers over 50 videos demonstrating the development of a range of applications [ee]. These videos show the desktop application features of Alpha Five and its web features [ff].

Caspio

Caspio is used to build Web 2.0 RIA .Net applications directly from database tables. "Caspio's cloud platform includes an enterprise-grade online database and application creation tools for business users to launch web applications securely in the cloud", at a rate they claim is "20 times faster than traditional coding." It includes Microsoft SQL Server for online database support.

Caspio can be used to build web forms in minutes [gg]. Some of its features are:

- *"Step-by-step wizards*
- *Fully customizable notification and acknowledgement emails*
- *Easy Multi-Application integration*

aa Iron Speed Designer is at <http://www.ironspeed.com>.

bb A demonstration video of Iron Speed Designer is at: <http://www.ironspeed.com/products/VideoDemo.aspx>.

cc See the Iron Speed Designer White Papers at: <http://www.ironspeed.com/products/WhitePaper.aspx>.

dd Alpha Five is at: <http://www.alphasoftware.com/>.

ee Over 50 demonstration videos on Alpha Five are at: <http://www.alphasoftware.com/video/v10/>.

ff Visit: <http://www.alphasoftware.com/products/v10/video/A5V10DesktopAppVideos/> for desktop application features and Web features of Alpha Five.

gg Caspio is at <http://www.caspio.com/>. Caspio web form features are listed at <http://www.caspio.com/online-database/web-forms-online.asp>.

- *Any application style; Web forms, searches, reports, web user authentication, end-user password recovery, mobile forms and more*
- *Full selection of professionally designed application styles*
- *Styles applied to any application with one click*
- *CSS-compliant for advanced design requirements*
- *Simply copy and paste deployment code*
- *Seamless integration with any site*
- *Innovative Search Engine Optimization (SEO) deployment method*
- *Compatible with all browsers and popular web design tools*
- *No per seat fees*
- *Unlimited application users*
- *Supported file formats include Microsoft Excel, Access, CSV, delimited or fixed-width text, and XML*
- *Perform search on records of any Data Type: text, number, date, time, etc.”*

Jackbe JackBuilder

Jackbe JackBuilder [hh] provides a visual development environment for creating Ajax applications using *The JackBe NQ Ajax Framework™* released in 2003. JackBuilder is a “set of development tools and runtime environment that allows rapid development of sophisticated, rich-client applications using Ajax. It offers a unique approach to design, development and delivery of Rich Internet Applications (RIA). Applications developed using JackBe technology work seamlessly in most standard Web browsers, and do not require any plug-ins or software installation. With JackBe Software’s unique optimization technology, rich interactive applications running inside a browser are delivered with minimal bandwidth usage and maximum functionality.”

Their website states that: “*The JackBe NQ Ajax Framework offers several advantages when compared to other Ajax development platforms and non-Ajax approaches to rich Internet applications. These advantages include:*

- **Ajax-based** - *fully standards based secure architecture requires no plug-ins*
- **Fully Integrated Environment** - *rich set of features bundled and integrated together*

^{hh} The Jackbe Ajax Framework details are at: http://www.jackbe.com/products/enterprise_ajax_framework.php. Two White Papers are available for download.

- **Visual Development** - WYSIWYG model dramatically simplifies Ajax application development and improves developer productivity
- **Cross-Browser** - support for all major browsers including Internet Explorer, Firefox, Safari and others
- **Multi-platform support** - runs on any platform: Java, J2EE, PHP, etc.
- **Framework agnostic** - integrates with any presentation and business tier framework: Struts, JSF, JSP/Servlets, etc.
- **High Performance** - delivers rich user experience, even with low bandwidth

Adobe LiveCycle Designer

Adobe LiveCycle Designer [ii] is used to: “create form and document templates that combine high-fidelity dynamic presentation with sophisticated XML data handling. Documents and forms adjust when merged with data to accommodate the content and volume by including or excluding design elements, growing to create space, and paginating automatically. LiveCycle Designer ES2 provides intuitive graphical design capabilities that make it easy to create and deploy templates without deep technical knowledge.” It is used to:

- “Easily author electronic forms.
- Use advanced data binding to XML schemas, web services, databases, and XML data files
- Enjoy support for label printers and RFID barcodes.
- Work with a spell-check system and customizable dictionaries.”

“LiveCycle Designer provides an easy method of creating form behaviors (actions) without the need to write scripts. With a few clicks you can add or remove fields or whole sections of a form, show a help dialog box, add attachments, change a field's color, and create many more actions.”

Adobe describes its Application Modeling Technology as follows:

“The new Adobe application modeling technology brings model-driven development to Flex® and Adobe LiveCycle® software developers. The technology enables developers to write applications at a higher level, reducing the amount of code and simplifying data integration in the development of applications.

Adobe application modeling technology is similar to other data modeling languages in that it supports a mechanism to define data entities and relationships. However, this capability is not adequate when it comes to building today's data-centric applications. Adobe application modeling technology fills the gap by adding support for services and data behaviors. Specifically, the model becomes a representation of the application, instead of a representation of your data. This enables the various components of your

ii Adobe LiveCycle Designer is at: <http://www.adobe.com/products/livecycle/designer/>.

application to share data and business logic.”

Further information on the Adobe Application Modeling Technology is available from the Adobe website [jj].

Cloud Computing and SaaS Products

The emergence of Virtualization software and technologies in recent years, which we discussed earlier in Chapter 15, has resulted in the evolution to Cloud Computing and *Software as a Service* (SaaS). We will now conclude this product section of Chapter 15 with a discussion of the following Cloud Computing and SaaS Products:

- Salesforce.com
- Microsoft Cloud Computing
- Handysoft BizFlow WebMaker
- Corticon BRMS
- Cordys Process Factory
- Intalio BPMS
- Amazon Web Services

Salesforce.com

Salesforce.com is considered one of the leaders in Cloud Computing [kk]. *Customer Relationship Management* (CRM) products for salesforce automation are offered through *Sales Cloud* and for customer service through *Service Cloud* [ll]. They are full-featured CRM products. Because these products are available through the cloud, they are charged on a per user monthly subscription basis, ranging from \$A5 – \$A360 per user per month (Australian pricing) at the time of writing.

As well as offering the CRM salesforce automation and customer service products, *Force.com* is also provided as a Cloud Computing platform for building your own applications [mm]. For example, Force.com states that:

“Every business needs apps: HR apps, inventory apps, iPhone, iPad, Android, and Blackberry apps. Now you can use the Force.com platform to build all of your apps—and websites—quickly and easily.

- *100% cloud—requires no hardware or software*
- *Mobile—run your apps on any platform or device*
- *Social—add collaboration features to every app”*

“With Appforce, you can build apps 5x faster at about 1/2 the cost of

^{jj} Adobe Application Modeling Technology is at: <http://www.adobe.com/products/lifecycle/applicationmodeling/>.

^{kk} A video by Salesforce.com on Cloud Computing is at: <http://www.salesforce.com/au/cloudcomputing/>.

^{ll} Sales Cloud 2 products are at: <http://www.salesforce.com/au/crm/sales-force-automation/>, with Service Cloud 2 products at: <http://www.salesforce.com/au/crm/customer-service-support/>. These links list the many products and services that are offered. Each product can be easily tailored to address your requirements.

^{mm} Force.com capabilities are at: <http://www.salesforce.com/au/platform/force.com/>.

traditional software platforms. Build HR apps, financial apps, project management apps, and much more, without being a professional coder.

- *Build apps with 80% clicks and 20% code*
- *Run your apps easily on mobile devices*
- *Allow your users to create their own reports and dashboards”*

“Visual process tools and wizards make it second nature to add complex business logic to your apps.

Running your apps on an iPhone, BlackBerry, or Android device is easy. Just enable mobile access, (and) install the Salesforce mobile client ...

Wizards help your users configure the built-in reporting and dashboards. And because data-sharing rules are strictly enforced, they’ll only see the data they should see.”

Siteforce [nn] is used to build websites in the cloud: *“With Siteforce, you can build data-rich websites and web apps quickly. It includes site hosting, content management, a database, and a content delivery network.”*

VMforce is used to build enterprise java apps [oo]:

“Build and run your enterprise Java apps without worrying about provisioning, maintaining, or scaling hardware, app servers, or databases. VMforce makes everything fast and easy.

- *Develop locally in the Eclipse-based Spring IDE*
- *Code with standard Java, including POJOs, JSPs, servlets, Spring, and JPA*
- *Drag-and-drop your project to deploy to VMforce”*

ISVforce is also available for distribution of your developed apps to ISVs [pp]:

“ISVforce provides all the tools and resources you need to distribute your apps and grow your cloud business. More than 1,000 independent software vendors use ISVforce to reach millions of customers.

- *Customer lifecycle management, from trial to deployment*
- *Flexible packaging and distribution options*
- *Tools to support your customers in real time”*

Finally, salesforce.com offers *Database.com* [qq], its database capability that was used to implement all of the Salesforce.com applications and products. It enables organizations to easily implement their own databases in the cloud, without having to provide the infrastructure or backup capability themselves.

ⁿⁿ Siteforce is described at: <http://www.salesforce.com/au/platform/siteforce/>.

^{oo} VMforce is described at: <http://www.salesforce.com/au/platform/vmforce/>.

^{pp} ISVforce is described at: <http://www.salesforce.com/au/platform/isvforce/>.

^{qq} Database.com is described at: <http://www.salesforce.com/au/platform/database.com/>.

Microsoft Cloud Computing

Cloud Power is Microsoft's term for Cloud Computing [rr]. It is available as a private cloud or a public cloud, with the following capabilities, according to Microsoft:

"The public cloud model often has the potential to serve up the most radical cost savings:

- ***Pay only for what you use, as you use it.*** *This is perhaps the most compelling of any cloud value message. By moving your applications and workloads to a public cloud platform, your IT staff can instantly ratchet your resources up or down, depending on the immediate needs of any particular workload. Some large Microsoft customers have estimated they can reduce overall IT spend by a factor of 10 while gaining more agility to respond to new business demands.*
- ***Control server sprawl.*** *Placing workloads in the cloud means those workloads no longer require dedicated server capital expenditure investments. While the cloud isn't free, running applications there allows you to enjoy the possibility of reducing an application's server count all the way to zero.*
- ***Reduce data center facility costs.*** *Fewer servers mean a smaller data center footprint. That translates to direct savings on real estate, power, and cooling. It also translates to indirect savings on business continuity and facilities maintenance. Even though these savings extend to the private cloud model, the public cloud model offers small and medium-size businesses the possibility of eliminating the need for a data center.*

But as the new paradigm of cloud computing emerges, you'll see that a combination of private and public cloud models will be the most popular implementation. This combination provides the most flexible IT infrastructure and has compelling costs savings of its own:

- ***Decrease IT management costs via virtualization.*** *Scaling infrastructure to meet new workload demands, maintaining physical security, and software deployment and patching are just a few examples of costly IT management tasks that are decreased significantly by running a virtualized infrastructure.*
- ***Decrease IT management further with IT as a Service.*** *With private or hosted private clouds, your users will be able to provision many IT services on their own through self-service portals that can take direct action across a virtualized infrastructure. This can mean a significant saving on common help desk calls and other IT management tasks like procurement and server configuration. Specialized staffers are then free to*

^{rr} Microsoft Cloud Computing is at: <http://www.microsoft.com/en-au/cloud/default.aspx?wt.srch=1>

concentrate their talents on tasks specific to your business rather than on general technical problems.

- **Simplify IT chargeback models.** *Because private cloud computing enables your business to draw resources from a centralized pool of virtualized IT resources, the expensive siloed chargeback models that many enterprises use can evolve. CIOs will be able to allocate virtualized resources across workloads depending on immediate demand without the need for siloed purchasing or provisioning.*

The cloud's ability to save you money doesn't end with decreased IT spending. It can extend to making your front-line business operations more agile and reliable and your business more competitive, which can help you actually add revenue. Using the cloud, you can deploy software and products more quickly and respond to market opportunities globally in a fraction of the time required today."

The Microsoft Office desktop suite has been moved to the cloud as *Microsoft Office 365* [ss]. Microsoft states that: *"Office 365 brings together cloud versions of our most trusted email, communication and collaboration software, Exchange Online, SharePoint Online and Lync Online with our familiar Office Professional Plus desktop suite."* This provides: *"online companions to Word, Excel, PowerPoint, and OneNote, which let you review and make light edits to documents directly from a browser."*

Handysoft BizFlow WebMaker

Handysoft *WebMaker* [tt] is a *Web 2.0 Rich Internet Application* development environment with a drag-and-drop environment for Rapid Application Development. WebMaker has a forms development capability and can interface with forms from Adobe LiveCycle or Microsoft InfoPath. It can create JSR 168 portlets (JSR 168 was discussed in the Products online section of Chapter 14, when we discussed WSRP).

In addition, *BizFlow* is a complete BPM Suite, with extensive capability for BPM and SOA. BPMN is used for Process Modeling within BizFlow and supports business rules with interfaces to third-party business rule engines. It supports SOA and Web Services for integration, with an *Enterprise Service Bus* capability and apparently supports BPEL. BizFlow uses KPIs for *Business Activity Monitoring* and process optimization. It offers ProjectFlow, which is a comprehensive Project Management capability. Two demos on their website show this use of BizFlow [uu]. These demonstrate *Business Process Monitoring* for performance improvement and also show *Document Content Management*, with Dynamic Tasking for exception situations, along with use of email and other communication.

^{ss} Microsoft Office 365 is at: <http://www.microsoft.com/businessproductivity/en/au/products/office-365.aspx>.

^{tt} Handysoft BizFlow WebMaker is at: http://www.handysoft.com/products/bizflow_webmaker.

^{uu} A Federal demo and a Commercial demo of BizFlow are available at: <http://www.handysoft.com/whatisbizflow>.

Handysoft claim that:

“WebMaker increases implementation productivity by 40%-60%. And since applications are not hard-coded, developers can change User Interfaces through simple clicks, drags, and edits, saving another 40%-50% in change management resources.”

Furthermore, Handysoft claim that:

“BizFlow® enables Dynamic BPM. Dynamic BPM holds that business processes constantly evolve due to both organizational change (e.g., changing workforce, business objectives, and competitive realities) and technological change (e.g., new applications and new capabilities), and that organizations should do everything in their power to align people with process to measurably enhance worker effectiveness. As a result, organizations need a ‘business process platform’ that supports rapid change and creates agile applications.

Designed for both business users and IT professionals and built to support dynamic business environments, BizFlow® moves beyond the flat, one-dimensional feel of traditional process management solutions. It offers vivid drill-down capabilities, sound critical path identification and analytics, as well as enhanced dynamic process automation. Each of these key, next-generation capabilities provides users the ability to deploy business processes that adapt to and evolve with an organization’s ever-changing business environment.

BizFlow® is a full featured BPM solution platform. Everything needed to create a process-driven application is included. Functionality and their underlying capabilities include:

- *Process Modeling*
- *Business Rules*
- *Process Monitoring*
- *Dynamic Tasking (Ad-Hoc Routing)*
- *Business Application and Forms Development*
- *Flexible User Interfaces and Collaboration for Global Workforce*
- *SOA Integration*
- *Process Monitoring*
- *Business Activity Monitoring*
- *Security & Administration”*

Corticon BRMS

Corticon offer a *Business Rules Management System (BRMS)* [w]. We discussed Business Rules in Chapter 8. It appears that the Corticon BRMS can be used in conjunction with Handysoft BizFlow (see above). Corticon support *Business Rules Modeling Studio* and *Business Rules Server* based on Java or

^w Corticon BRMS is at: <http://corticon.com/Products/Business-Rules-Management-System.php>.

.Net. They also offer *RulesCloud*, hosted on Amazon EC2, which allows a rules engine to be run as SaaS in the cloud. Corticon state that:

“Corticon Business Rules Management System (BRMS) gives companies the ability to model their recurring business decisions, and automate them within enterprise systems to assure consistent and optimal results. This is done by managing the rules that drive decisions - including design, analysis, execution, and optimization ...”

“Corticon Business Rules Modeling Studio – (is a) standalone desktop environment to model, analyze, test and package business rules. Corticon Studio is the industry's first standalone desktop business rules modeler to capture and formalize mission-critical decisions into sets of interrelated business rules. The Corticon Studio has been designed specifically with the business user in mind. No programming skills are necessary. Using a very simple, easy-to-use spreadsheet-like interface, almost anyone can quickly learn how to model rules, analyze them for logical errors, and test the execution of even the most complex decision-making logic. The Corticon Studio is unique in its ability to test and verify rule sets for completeness and consistency prior to deployment. Through Corticon's patent-pending rules analysis capabilities, errors are found during modeling, reducing the risk of costly, ineffective deployments ...”

“Corticon Business Rules Modeling Studio - Enterprise Edition - Corticon Studio - Enterprise Edition adds Enterprise Data Connector feature to the baseline Studio product to create a compelling model-driven rule authoring application with the power to integrate enterprise data, without coding.

Corticon Business Rules Server – (is) a high performance execution engine that deploys rules from the Modeling Studio as decision services.
□ The Corticon Rules Server enables the automation and processing of the business rules within existing enterprise information systems. SOA-centric and based on Enterprise Java (J2EE), XML and Corticon's proprietary Business Rules Management technologies, the Corticon Server provides scalability across four dimensions: data, processes, rules and transactions. Most other business rules engines analyze rules during execution. This means significant processing is taking place, when systems are looking for an answer from the rules engine. Because of Corticon's Design-Time-Inferencing™ (DeTI), this same analysis takes place during the design process. Corticon is thus able to deliver a fast, optimized executable into your production environment.

Corticon Business Rules Server for .NET – (is) Corticon's highly scalable rule engine for .NET environments. □ This installs and runs natively in .NET environments and executes the same Studio-modeled decision services that run on Corticon Server. So whether you have an all-Microsoft shop or run a mix of technology platforms, Corticon has rule engines that suit your needs, and a unique model-once, deploy anywhere architecture that can best satisfy your dynamic application development and IT landscapes.

Corticon Enterprise Data Connector – (is) a package of tightly integrated components that deliver enterprise data integration and analysis for decision automation. □ With Corticon's unique model-driven approach to data

connectivity, connecting business rules to enterprise data is a snap - there is absolutely no SQL coding. And since data is mapped separate from the business rules, changes to data sources do not force a re-model of your business rules. Corticon also features great flexibility in supporting your data access and update policies, easily changing settings for read-only and write authorization. Leveraging enterprise data within rules has never been so easy. There are many exciting use cases that Corticon EDC enables, including rule-driven analysis applications that complement Business Intelligence.

Corticon Business Rules Collaborator – *manages the business rules built in Corticon's Business Rules Modeling Studio. It helps organizations to control their rule assets throughout their lifecycle, with robust, multi-user management capabilities. Corticon Collaborator includes sophisticated workgroup features such as check-in and checkout, versioning, security and access control, workflow, and collaborative rules development.*"

Cordys Process Factory

Cordys Process Factory [ww] supports a drag-and-drop environment for RIA Forms design and development. It supports the creation of *Business Process Models* and enables Web Services to be used from CPF such as processes to be defined to integrate Google Docs with salesforce.com SaaS. Cordys state that:

"Cordys Process Factory (CPF) is a Web browser-based, integrated cloud environment for rapid Cloud Application Development. Cordys Process Factory allows users to use and sell Cloud Applications, and also subscribe for applications built by others in the Cloud Marketplace. All of this is achieved through visual modeling, without having to write a single piece of code."

The CPF "Composer enables users to create rich Web UI forms (webpages) by dragging and dropping from a wide variety of UI widgets such as text, date, currency, number, check boxes, picture fields etc. Users can also create tabs, groups, grids, attachments, comments, and embed external gadgets. Users can drag and drop Web services to the form.

The user can also add form rules to dynamically display messages, enable, or disable UI widgets, assign values, create formulas, etc. Apart from all these modeling capabilities, if at all required, users can also add Java scripts that will get triggered during the various form events ..."

"When a user creates a form, optionally, application objects can be created by the system automatically to persist the information entered in the forms. Users can also model the application objects, specify the primary key fields, unique fields, and required fields, and relate application objects to one another, model the logic on what has to happen when records are modified, etc."

^{ww} Cordys Process Factory is at: <http://www.cordysprocessfactory.com/>.

Intalio BPMS

Intalio is one of the first organizations to develop and deliver a complete *Business Process Management System (BPMS)* [xx]. We discussed this product in the Product PDF for Chapter 14 [yy]. A wealth of information is provided on the Intalio website. As described by Intalio:

“Intalio provides an integrated portfolio of applications for cloud computing. Our products can be deployed on premises for maximum security and control, or on public clouds such as AWS (Amazon Web Services – see below). Applications developed with Intalio|Cloud [zz] are elastic and multi-tenant, automatically...”

“Intalio|BPMS is the world's most widely deployed Business Process Management System (BPMS). Designed around the open source Eclipse BPMN Modeler, Apache ODE BPEL engine and Tempo WS-Human Task service developed by Intalio, it can support any processes, small or large.”

“Intalio|Jetty is the most widely deployed Java application server. Its small memory footprint and high performance make it the perfect choice for Cloud Computing applications. Intalio|Jetty is also the only Java application server small enough to fit on a cellphone.”

Amazon Web Services

Amazon Web Services provide a Cloud Computing infrastructure: the *Amazon Elastic Compute Cloud (EC2)* [aaa]. As stated by Amazon:

“Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers. □□ Amazon EC2’s simple web service interface allows you to obtain and configure capacity with minimal friction. It provides you with complete control of your computing resources and lets you run on Amazon’s proven computing environment. Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change. Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use. Amazon EC2 provides developers the tools to build failure resilient applications and isolate themselves from common failure scenarios.”

xx Intalio|BPMS is at: <http://www.intalio.com/bpms>. This link describes the Community Edition and the Enterprise Edition, with pricing: *“Intalio|BPMS Community Edition is entirely free of charge and is supported by our online community. Intalio|BPMS Enterprise Edition is licensed through yearly subscriptions on a CPU basis and comes with professional support and maintenance.”*

yy Intalio BPMS is discussed in more detail in http://www.ies.aust.com/EA_Book/Chap-14-Products.pdf.

zz Intalio Cloud Computing products are at: <http://www.intalio.com/products>. This discusses SaaS products, such as: BPM support; CRM; and *Document Management System (DMS)* products – *Platform as a Service (PaaS)* products, such as: *Application Builder: Mashup Studio; Process Designer using BPMN; Report Editor; and Application Engines*. Products for *Infrastructure as a Service (IaaS)* are also discussed.

aaa The Amazon Web Services are described at: <http://aws.amazon.com/>.

“Amazon CloudFront is a web service for content delivery. It integrates with other Amazon Web Services to give developers and businesses an easy way to distribute content to end-users with low latency; high data transfer speeds, and no commitments. □□Amazon CloudFront delivers your static and streaming content using a global network of edge locations. Requests for your objects are automatically routed to the nearest edge location, so content is delivered with the best possible performance. Amazon CloudFront is optimized to work with other Amazon Web Services, like Amazon Simple Storage Service (S3) and Amazon Elastic Compute Cloud (EC2). Amazon CloudFront also works seamlessly with any origin server, which stores the original, definitive versions of your files. Like other Amazon Web Services, there are no contracts or monthly commitments for using Amazon CloudFront – you pay only for as much or as little content as you actually deliver through the service.”

As is now very apparent from the descriptions of Cloud Computing products and services above, a new era of IT is upon us. We are now freed from the need to host applications and databases on expensive in-house data centers, with similarly expensive application development and maintenance resource costs. Instead, these costs can be moved to the cloud, paying only for the infrastructure and services that we need – with the ability to scale up or down as required. This is truly a brave new world.

We have now completed our discussion of *Modeling Tool, RIA and Cloud Computing products*. Return to Chapter 15, continuing from: *Summary of Key Enterprise Architecture Principles*, where we will conclude the book.