



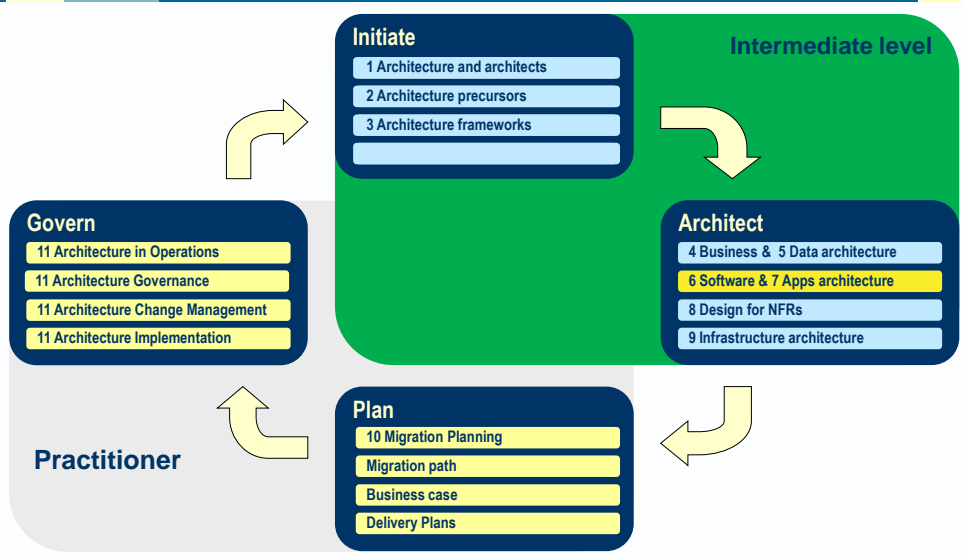
Avancier Reference Model

Applications Architecture (ESA 7)

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7. Applications architecture



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Applications architecture in the AM core framework for EA



	<i>Passive Structure</i>	<i>Required Behaviour</i>	<i>Logical Structure</i>	<i>Physical Structure</i>
Business		Business Service Business Process	Function Role	Org Unit Actor
Data / Information	Data Entity	Data Flow	Log Data Model	Data Store
Applications		IS Service	Applicat'n Interface	Applicat'n
Infrastructure Technology		Platform Service	Platform Interface	Platform Application

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7. Applications architecture



7. Applications architecture
Basic concepts
Applications architecture structure
Applications architecture behaviour
Application connection styles
Application interoperation styles
Application integration

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Conceptual framework

	Required behaviour	Logical Structure or Interface	Physical Structure
Applications	<pre> graph LR A[App/IS Service] --- B[Application Interface] B -.- C[Application] </pre>		
App/IS service	[a service] that can be requested of a business application; a use case or fully automated service, provided by one application to an end user or another application.		
Application interface	[an interface] a collection of application services accessible by application clients; it identifies services, may provide access to them, and hides what performs them. It may be defined in a user interface or API.		
Application	[a component] a software system or program, divisible into three categories: platform, generic and business application.		

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App portfolio management

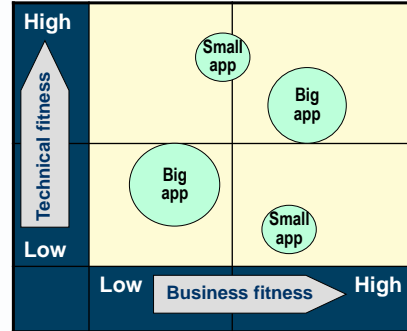
Apps portfolio management	[a work process] to catalogue, describe, and value the applications of an enterprise, with a view to rationalisation or optimisation of those applications.
Application classification	<p>[a technique] for categorising applications to group them for management of the application portfolio.</p> <p>E.g. by application type, by business function, by importance, or by health.</p>

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Classifying apps in the app portfolio



- ▶ Classify apps to understand them
 - Cost, Value (mission critical <> unimportant),
 - **Business fitness, Technical fitness**
 - Size, Complexity
 - User type: Public / Employee / Technical
 - Generality: Universal <> Unique to business
 - User base: Single-user - Dept - Enterprise
 - Usage style: OLTP / Business Intelligence
- ▶ Score or rank apps



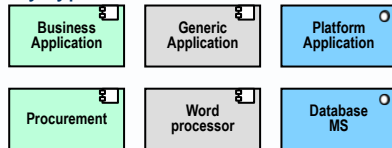
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Application classification in the BCS ESA reference model

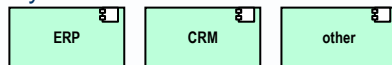


- ▶ The reference model is thin here
- ▶ It classifies apps only

- **By type**






- **By business function**



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Applications by type – in BCS ESA reference model



<p>Business application</p> 	<p>[an application] that captures or provides data (via use cases) to support a business role or process. It has breadth in terms of use cases and depth in terms of software layers.</p> <p>E.g. accounting; billing, customer relationship management, enterprise resource planning, business intelligence, patient administration.</p>
<p>Generic application</p> 	<p>[an application] that offers universal use cases.</p> <p>E.g. calculator, drawing tool, groupware, media player, spreadsheet, browser, word processor.</p>
<p>Platform application</p> 	<p>[an application] or system software that runs computer hardware or serves other applications.</p> <p>See section 9 for more detail.</p>

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Compare with classification of applications by type in TOGAF



- ▶ Business
- ▶ Infrastructure
 - (= generic business apps)
- ▶ Platform
 - (= technical infrastructure apps)

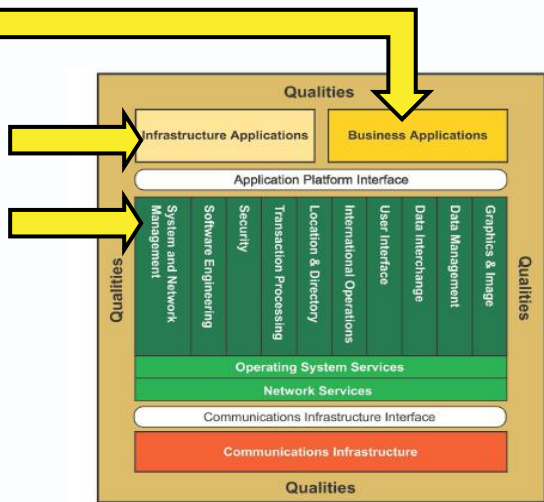


Figure 43-2 Detailed Technical Reference Model (Showing Service Categories)

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Applications by business function - in the NCC



▶ NCC: Conspectus & Evaluation Centre

- **ERP**
- **CRM**, Call Centre & Marketing
- Accounting & Financial Reporting
- Data Warehousing, Business Intelligence & CPM.
- Document Management, Content Management & BPM.
- HR & Payroll
- Project Management & PSA

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The ERP class of apps



Enterprise Resource Planning (ERP)

[a business application] that supports the planning of how enterprise resources (materials, employees, customers, etc.) are acquired, moved from one state to another.

An ERP system maintains data needed for some or all of Manufacturing, Supply Chain Management, Financials, Projects, Human Resources, Data Warehouse and Management Information.

It can include Customer Relationship Management and Billing.

- ▶ http://www.evaluationcentre.com/erp_software/home.go
- ▶ 23% deploy ERP as their main application strategy
- ▶ 13% deploy ERP with other standalone packages
- ▶ 13%, deploy ERP in combination with bespoke solutions
- ▶ 23% based core systems on standalone best of breed packages
- ▶ 17% on bespoke solutions

Survey population
manufacturing sector (23%)
public sector (17%),
retail (10%)
distribution & logistics (7%),
IT & telecoms (7%)
financial services (7%).

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The CRM class of apps



Customer relationship management (CRM)

[a business application] that supports the development and maintenance of mutually beneficial long-term relationships with customers.

It helps with some or all of the following
attracting customers,
transacting business with customers,
servicing and supporting customer,
enhancing customer relationships.

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7. Applications architecture



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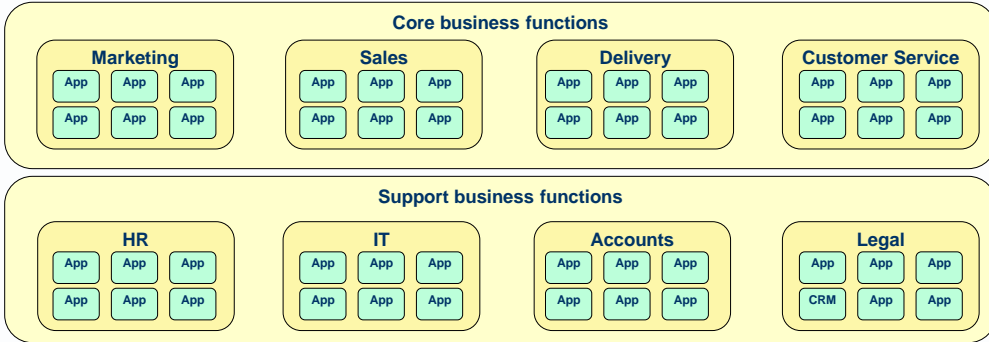
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Applications by business function - in the BCS ref. model



Application portfolio catalogue

[an artefact] listing business applications and recording their properties.
Usually structured so as to reflect the business function hierarchy.



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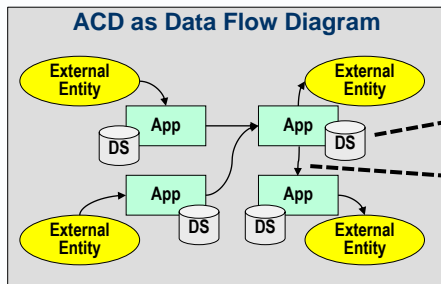
Applications architecture: structural communication model



Applications communication diagram

[an artefact] that shows how applications are related by the exchange of data.

Typically some kind of data flow diagram, or, where there are too many data flows, a dependency diagram.



Data store (records of data entities)

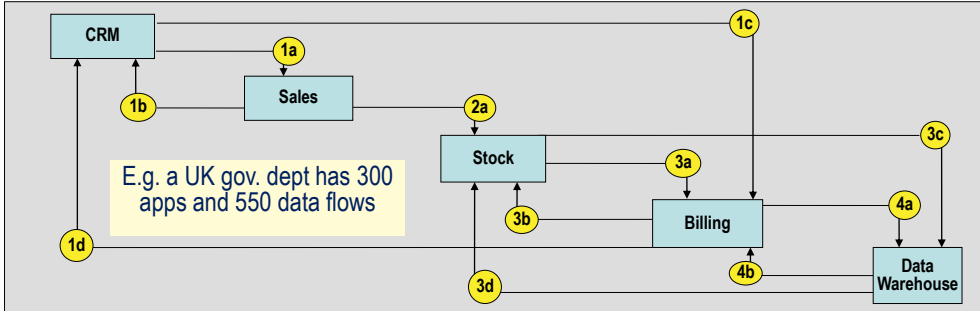
Interface = Data flow (messages about data entities)

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A structural model of the applications network



Application Communication Diagram (cf. N2 model, or Node Connectivity diagram in FEAF)



Data Flow Catalogue

Data Flow id	Source App	Destination App	Data content	Trigger event
1a	CRM	Sales	Sales order request	New sales order
1b	Sales	CRM	Sales order confirmation	Order created in the Sales system
2a	Sales	Stock	Requisition	Subscribe/Publish timer

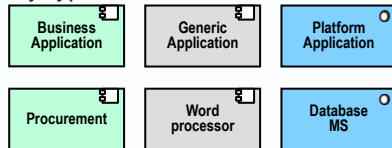
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Application classification in the BCS ESA reference model

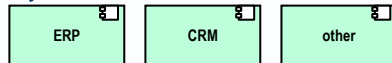


- ▶ The reference model is thin here
- ▶ It classifies apps only

By type



By business function

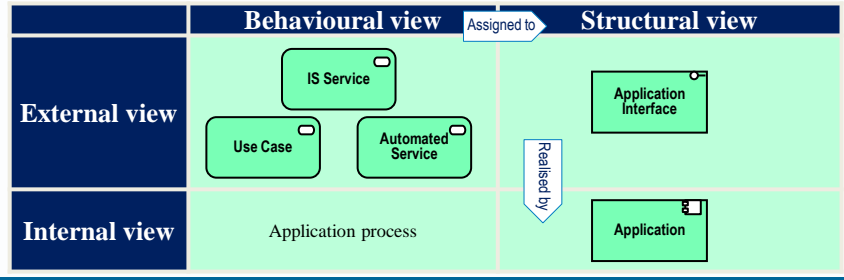


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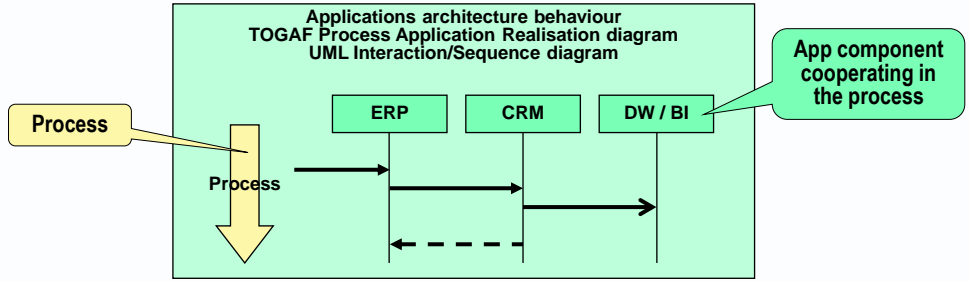


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Applications architecture behavioural model



Process realisation diagram [an artefact] that shows how applications inter-communicate to enable a process. It is often used to examine where time is spent in or between application processing steps. Typically drawn as an interaction or sequence diagram



- ▶ What applications cooperate in the execution of a process?
- ▶ How and when are applications triggered by invocations?
- ▶ What data flows or messages are passed along with an invocation?
- ▶ Useful in analysing the efficiency of a process
- ▶ Shows the overall sequence of a process
- ▶ Limited representation of logic (loops, options & quits)

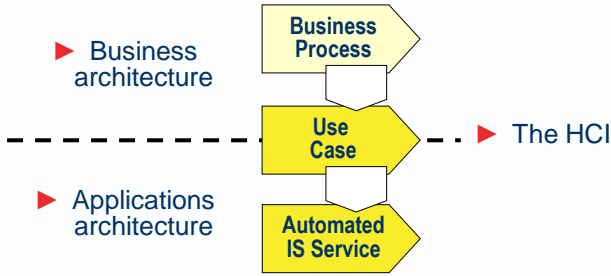
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IS services



Information system service

[a service] use case or automated IS service provided by one application to another, or to an end user.



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Use cases

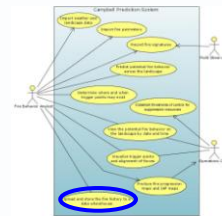


Application use case diagram

[an artefact] that shows the uses cases supported by an application.

An application is scoped and defined by the use cases it supports.

Use Case Diagram



- ▶ What uses do external entities make of an application?
- ▶ What processes are in the scope of our application ?

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Use cases



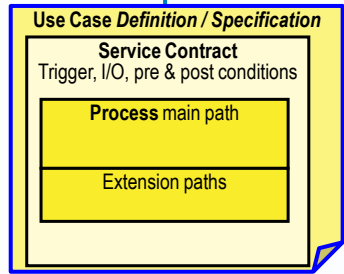
Use case definition [an artefact] that defines a use of a system by an actor, in the course of an OPOPOT business process or role.

It is normally named as a goal in verb-noun form (e.g. assess claim).

It is usually defined by its service contract (trigger event, inputs and outputs, preconditions and post conditions, and non-functional requirements) and process flow (main path and alternative or exception paths).

The details of each process step (including any services or transactions invoked) may be documented separately from the use case.

Use Case Diagram



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Delegating work to automated IS services



Goal / name	Price kitchen
Scope	Kitchen sales system
Actor	Salesman
Stakeholder	Customer
Precondition	Kitchen plan has been populated with kitchen items Kitchen order app is loaded onto the lap top
Trigger event	Customer wants to know price (so far, for an order) Salesman presses price kitchen command
Post condition	Price is displayed in price dialogue box
Main path	1 Salesman presses price kitchen command 2 Kitchen drawing app displays price dialogue box 3 Salesman clicks OK 4 Kitchen drawing app invokes Kitchen order app 5 Kitchen drawing app displays the reply in the Price field 6 Salesman closes the price dialogue box
Extension paths	3 Salesman closes the price dialogue box 5 Kitchen drawing app displays "Kitchen order app not available"
NFRs	

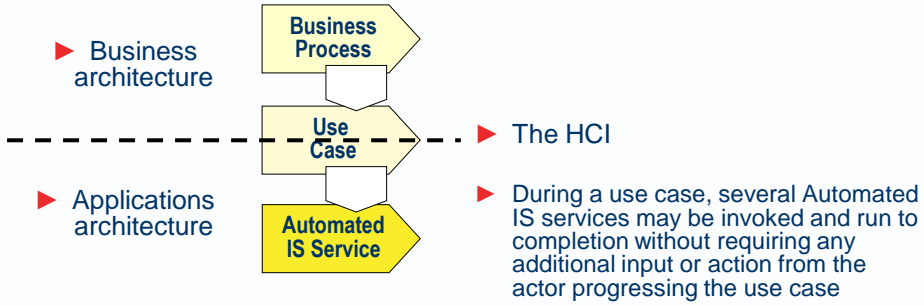
Invoke automated IS service

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Automated IS service



Automated IS service [a service] that a software client can invoke. It may be classified as a business service or data service. It is sometimes an ACID transaction.

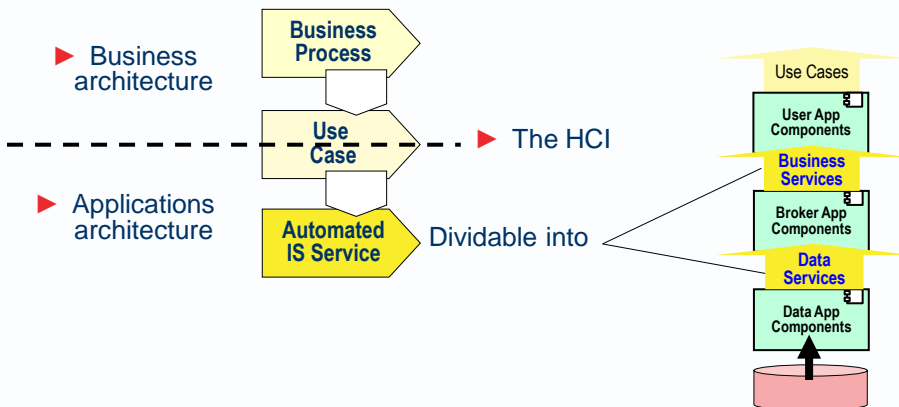


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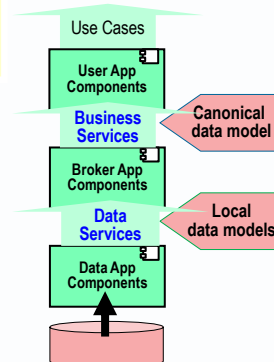


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Business process decomposition and automation



Automated business service	[an Automated IS service] a kind of automated service whose input and output data is defined in a canonical data model.
Automated data service	[an Automated IS service] a kind of automated service whose input and output data items are defined according to the parochial or physical data model of a specific data source.



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Transactions



Transaction	[a process] a unit of work, a buy-sell or client-server interaction between parties, e.g. between a user and a computer, or an application and a database.
ACID Transaction	[a transaction] a unit of work that is Atomic, Consistent, Isolated and Durable. It can be rolled back if a specified precondition is violated. Using a transaction manager to automate transaction roll back preserves the integrity of stored data and saves considerable design and development effort, but is impossible in loosely-coupled designs. Where a process has an update or output effect that cannot be rolled back, then compensating transactions may have to be designed.
Compensating transaction	[a transaction] a backtracking, undo or correction process. A process to handle the side effects of a process (or workflow) that started but could not complete successfully. It may undo updates committed to databases, remove messages placed in message queues, send follow-up correction messages, report cases of data disintegrity.

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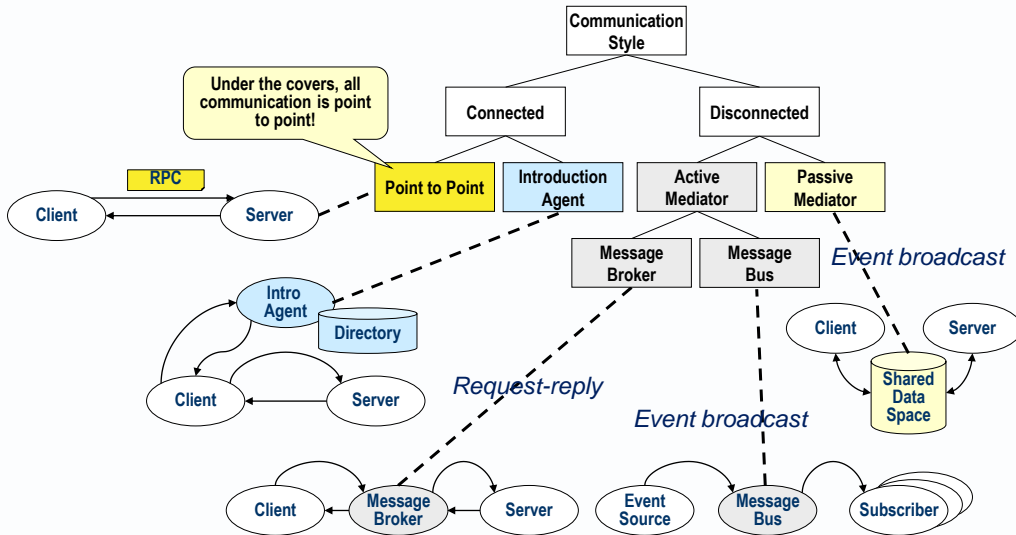
7. Applications architecture



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Communication styles – summary overview



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7. Applications architecture



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Applications Integration



Application integration pattern

[a pattern] for sharing data currently stored in several enterprise business databases, including those listed below.

- ▶ Patterns include
 - ▶ Point-to-point application integration
 - ▶ Hub-and-spoke application integration
 - ▶ ETL
 - ▶ Off-line integration
 - ▶ Data warehouse
 - ▶ Database / application consolidation
 - ▶ Physical master data
 - ▶ Virtual master data

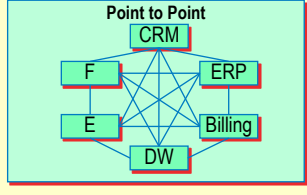
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Two contrasting integration patterns



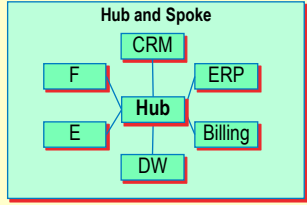
Point-to-point integration

[a pattern] in which subsystems talk to each other directly.



Hub and spoke integration

[a pattern] in which subsystems communicate via a mediator.



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ETL pattern or tools (Oracle call it ELT)



- ▶ Useful if you want to load data into
 - a data warehouse - perhaps on a regular basis, or
 - a consolidated database – perhaps during a one-off data migration

ETL

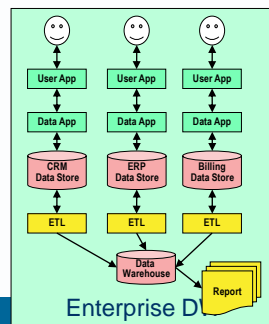
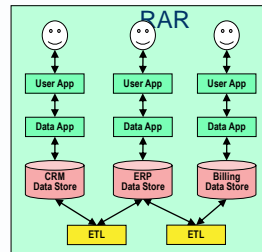
[a pattern] for extracting data from data sources, transforming data items from one format to another, and loading the reformatted data into data stores.

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Two more application integration patterns



Off-line integration	[a pattern] in which discrete data stores are synchronised off-line, often by overnight batch processes, often using ETL tools.
Data warehousing	[a pattern] in which business data is copied from on-line data stores into a central database for reporting, often using ETL tools. Data cleansing may be needed at any stage in the process.



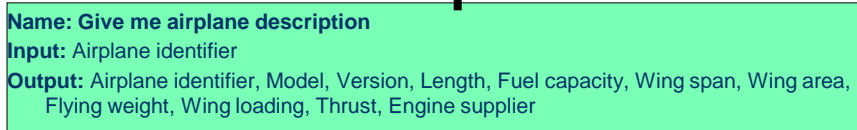
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So which option suits this story?

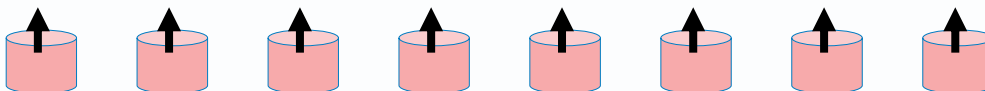
Database consolidation?
Physical master data management?
Virtual master data management?



100 of 500 major user apps need data about an airplane



100 of 500 major databases contain data about an airplane



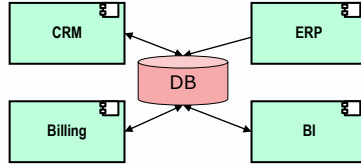
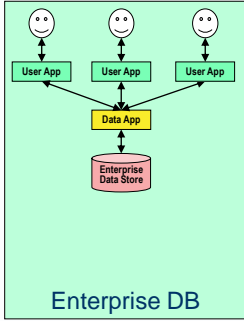
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Three more application integration patterns



Database consolidation

[a pattern] in which baseline applications become user application components accessing one shared database.



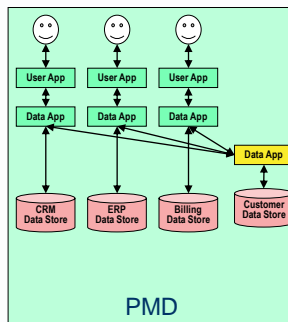
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Three more application integration patterns



Physical master data

[a pattern] in which a common data entity is stored in a discrete database, where it can be accessed by any application with a pointer to the common data.



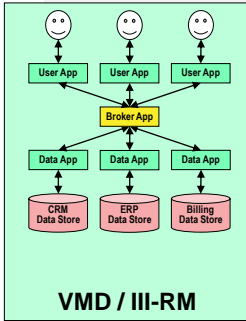
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Three more application integration patterns



Virtual master data (cf. III-RM)

[a pattern] in which required data can be integrated at run time from several data stores or sources by some kind of broker application. It features three layers of software components.



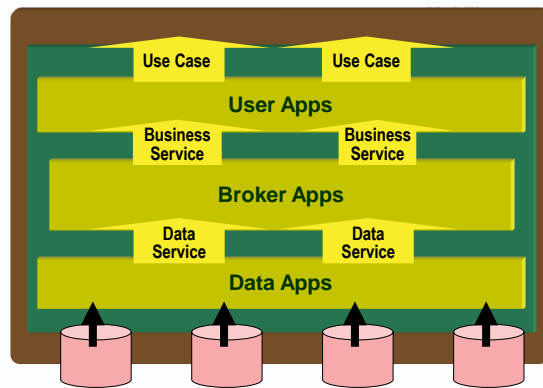
- ❖ **User apps:** present user interfaces, capture events from them and invoke broker apps.
- ❖ **Broker apps:** decouple by providing automated business services to user apps, and invoking data services from data app(s)
- ❖ **Data apps:** provide automated data services to put/get data to/from a particular database or other data source.

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IS Services in the BCS reference model



- ▶ **Use Cases**
 - Uses made by users
- ▶ **Business services**
 - Automated IS services that are invoked using data types in a canonical data model
- ▶ **Data services**
 - Automated IS services that need to understand data types in a local data sources

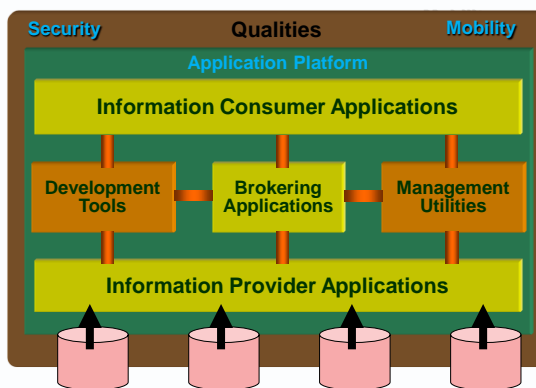


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The III-RM in TOGAF

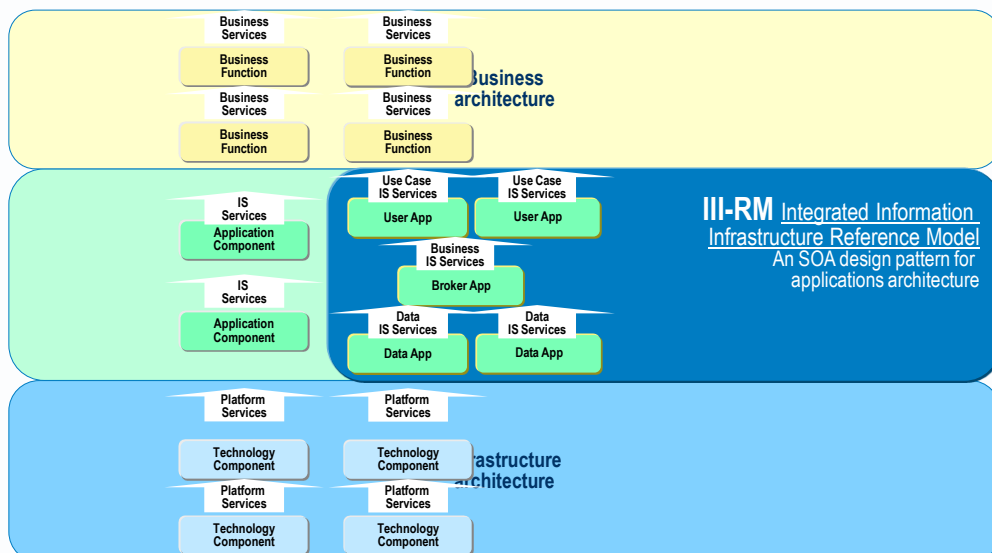


- ▶ **Information Consumer Applications**
 - deliver content to the user of the system,
 - provide services to request access to information in the system on the user's behalf
- ▶ **Brokering Applications**
 - manage the requests from any number of clients
 - to and across any number of Information Provider Applications
- ▶ **Information Provider Applications**
 - provide responses to client requests
 - and rudimentary access
 - to data managed by a particular server
- ▶ The overall set creates an environment that provides a rich set of end-user services for transparently accessing heterogeneous systems, databases, and file systems.
- ▶ **TOGAF v9**



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Integrated Information Infrastructure Reference Model (III-RM)



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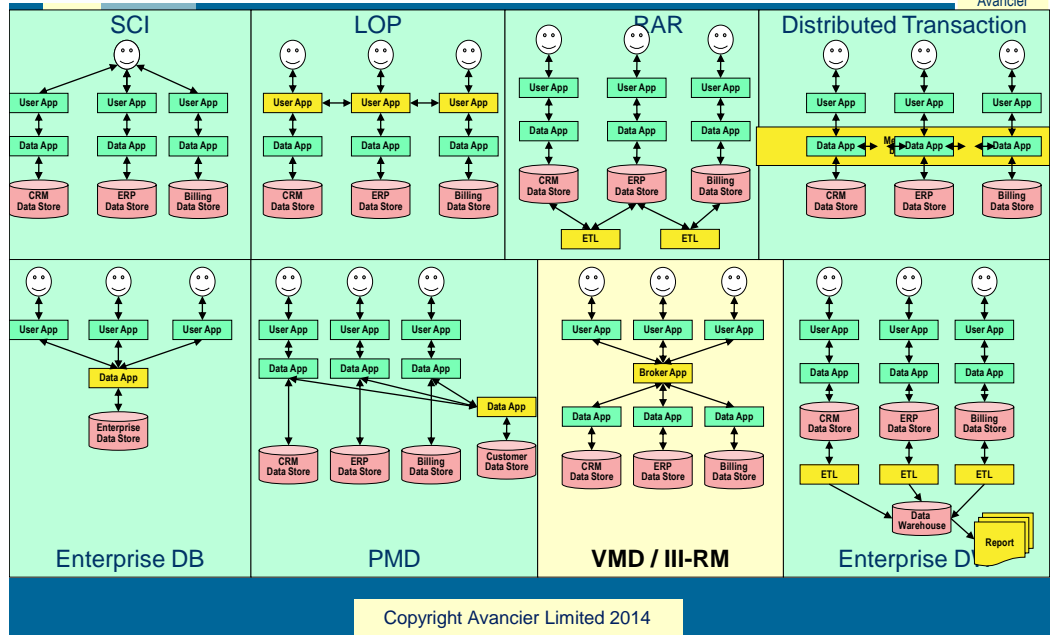
Reference model speak for these ideas

Boundaryless Information Flow	A trademark of the Open Group intended to express the vision of delivering any data, any time, to any place and anybody who is authorised to view the data.
Integrated Information Infrastructure Reference model (III-RM)	A pattern in TOGAF for a service-oriented architecture. User applications invoke services provided by broker applications, which in turn invoke services provided by applications that encapsulate data sources.

Business	Buy space	Internal Space			Sell space					Workflow
	Procurement	Manufacturing, Assembly Legal, Finance,			Customer support, Selling					
HCI	User App	User App	User App	User App	User App	User App	User App	User App	User App	Storage, Replication
Business services	Broker App, Broker App, Broker App, Broker App									Workflow, Messaging & Directory services
Data Services	Data App	Data App	Data App	Data App	Data App	Data App	Data App	Data App	Data App	Storage, Replication
	D'base	D'base	D'base	D'base	D'base	D'base	D'base	D'base	D'base	
	Parts	Procure	Design	Build	Ship	Sales	Fulfillment	Billing	Support	

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Application integration patterns



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