THE ART OF B2B INTEGRATION

A STUDY OF THE STATE OF ART B2B INTEGRATION PATTERNS, COMPONENTS AND ARCHITECTURES

ABSTRACT

To be on the lead in modern business operations, it has become imperative that processes, systems and sometimes organizations integrate. Thus developing a

The growth and change of the software technology is at a very rapid development requiring almost every software system to have constant modification and configuration so as to provide enhanced integrated solutions to the changing world. Often, we have heard of Integrated solutions. Simply put its developing an approach to collaboration, communication, resource sharing, optimization, profitability and efficiency.

Integration in the computer industry, is a general term for the software that mediates or joins together two or more separate and usually already existing programs, applications, or systems. Integration tools and applications involves allowing different systems to interoperate and communicate with each other within or beyond a business enterprise, thus allowing complete integration of heterogeneous data sources among different applications.

INTRODUCTION

Application integration is the secure and coordinated sharing of processes and data within or outside an organisation's platform.

In the current digital economy, businesses values and competitive advantage are beyond the enterprise boundaries and therefore focus on relationships with its different partners. The business landscape is changed and is rapidly changing and affects the way enterprises conduct

24   business between its partners as well as the management of the internal business processes.

25   Collaborative e-commerce is the current wave and it requires dynamic creation and management

26   of trading relationships with partners, the public and private business processes automation,

27   increased adaptability and increased flexibility through an integration middleware. Thus business

28   processes are affected heavily by other processes and need for interoperability. When systems

29   integrate, processes are affected, service delivery must change and thus entire planning formula

30   has to be integrated as well.

31   B2B integration is the integration of applications, programs, or systems beyond the walls of an

32   organisation thus extending the organisation in terms of size, service and processes, value and

33   relations. B2B includes heterogeneous infrastructures, data, application software, and business

34   processes integration between two or more businesses. It enhances exchange of data, unify

35   software components, and streamline business processes (Laudon&Traver, 2013). B2B

36   integration strategy should aim to have an integrated, real-time application-to-application,

37   system-to-system interaction with all the partners including the existing ones and new ones. The

38   strategy should also aim to eradicate all the manual steps in business processes, conduct real-

39   time and secure transactions over the Internet, be flexible to accommodate different modes of

40   interaction for each partner, and be able to adapt to change easily and quickly.

41   ## 1. INTEGRATIONS

42   ### 1.1. Integration Overview

43   Sharing of information between systems had been very difficult in the past. The development of

44   many legacy systems used proprietary technology, which created islands of information in

45   different departments of an organization and between the organization's different partners.

46   Often, the development is incremental over time resulting in a haphazard architecture that resists

47   the evolution towards standardizing systems(Laudon&Traver, 2013). B2B integration is an

48   important requirement for businesses that need to share information between its various

49   departments and partners and automate its activities involving multiple business functions,

50   departments, and businesses. More than ever, businesses need efficient management and

51 integration of their information in order to remain viable in the ever increasing competitive
52 market.

53 B2B integration was defined as the integration of applications, programs, or systems extending
54 the walls of an organisation and it include heterogeneous infrastructures, data, application
55 software, and business processes integration between two or more businesses. B2B integration
56 has been developed to handle information between businesses, business processes, and other
57 components of interest between businesses. It is a top priority for the competitive businesses
58 with an objective of linking data in the diverse information across its partners (Wong, 2013).
59 This report focuses on integration techniques that extend through various businesses.

60 There is also need to consider integration of information resources and how they work together
61 in the form of data, process, and application etc. An information resource is an object or a service
62 that can handle, process, or produce data in a way that involves communication with external
63 information resources. When information resources work together, either on a network, or like
64 objects within an application, integration is achieved. This is definition cuts across all levels of
65 integration.

66 ## Integration Technologies

67   1. Queuing
68   2. Propagation
69   3. Application adapter
70   4. Service management
71   5. Database
72   6. Transaction management
73   7. Workflow management
74   8. Security
75   9. History management
76   10. Business intelligence
77   11. Transformation / Translation
78   12. Repository

79 **Types of Integration**

80 There are several different systems that divide integration solutions into different levels. One
81 way is dividing integration techniques into external and internal integration. In more detail,
82 categorization focuses on the scalability and the flexibility of the integration solution. In this
83 later categorization, the various levels include data, platform, component, application, process,
84 and B2B integration. A brief discussion of the types of integration

85 *a. Platform Integration*
86 Platform integration is the solutions for connectivity and interface between systems having
87 different hardware, operating systems, and applications. Platform integration solutions are
88 individual and different Remote Procedure Calls (RPCs) or Brokers carry out the
89 connection(Wong, 2013). Every integration solution is individual and the workload is therefore,
90 high when new systems need to be added to the present architecture, just as the first integration.

91 *b. Data Integration*
92 Data integration solutions provide tools that extract, transform, and move data. Data integration
93 includes integration of platform and it requires information about the database schemas that
94 underlie the data(Samtani, Healey&Samtani,2002). An example of data integration is the
95 movement of data between two databases through SQL. In many cases, data integration is
96 possible between two different database systems and platforms, which make use of API and
97 database connectivity drivers in accessing each of the servers of the databases and fetch data into
98 the other.

99 *c. Component Integration*
100 Component integration is the development of data integration where several network features
101 such as the load balance, session management, fault protection, and security are added to the
102 product. At the base of a component integration solution there is a server that handles the
103 network features and thus making it easy to add new logic(Samtani, Healey&Samtani,2002).
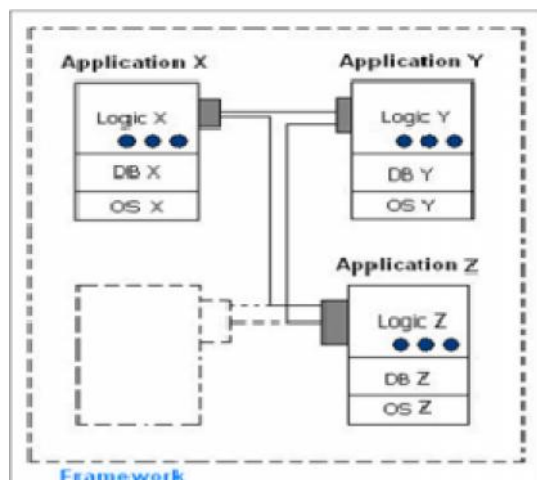
104 *d. Application integration*
105 Application integration solutions are those that provide a framework for creating and
106 changing the integration solution such as easy and fast addition of new applications. The

107   application integration framework consists of pre- built adapters for the most common systems,
108   which lower the time for adding new applications. When applications change, only the mapping
109   to the unified form must change and all the other applications remain unchanged. The solution
110   includes platform, data, and component integration. The figure below is a description of
111   application integration and the flexibility of the integration topology.

112   In employing application integration, an organization aims to create a framework that integrates
113   incompatible and distributed systems within an organization thus making it easier and faster to
114   extend its business processes throughout the organization (Nunamaker, Chen &Purdin,1991).
115   Today, every organization must strive to develop a framework, tools, and infrastructure to
116   accomplish this integration. Enterprise integration is the process of making disparate applications
117   work together to produce a unified set of functionality. This process entails more than just
118   integrating the applications but also considering the criteria, integration options, patterns and
119   policies as well as the definition of the best approaches in integrating the applications.

120   Enterprise application integration is the use of software and computer systems architectural
121   principles to integrate a set of enterprise computer applications. It is the business computing term
122   for the plans, tools, and methods of modernizing, consolidating, and coordination of computer
123   applications(Wong, 2013). Typically, enterprises have existing legacy applications and
124   databases, which they want to continue to use while they add or migrate to new set of
125   applications that exploit e-commerce, Internet, extranet, and other technologies as they emerge.
126   When new applications are developed, the must fit into the view of the business and applications
127   view of an enterprise. Ways to efficiently reuse the resources that already exists while adding
128   new applications and data must also be devised.

129

130   **Figure 1.1 Application Integration**

131   *e.   Process Integration*

132   Process integration is the integration using a graphical modelling interface above an integration

133   server and thus connecting all the applications (Samtani, Healey&Samtani,2002). Therefore, it

134   provides another level of abstraction and adaptability to integration solutions. This is done

135   through a graphical modelling interface above an integration server that connects all application.

136   The solutions of process integration enable business managers to define, change, and monitor
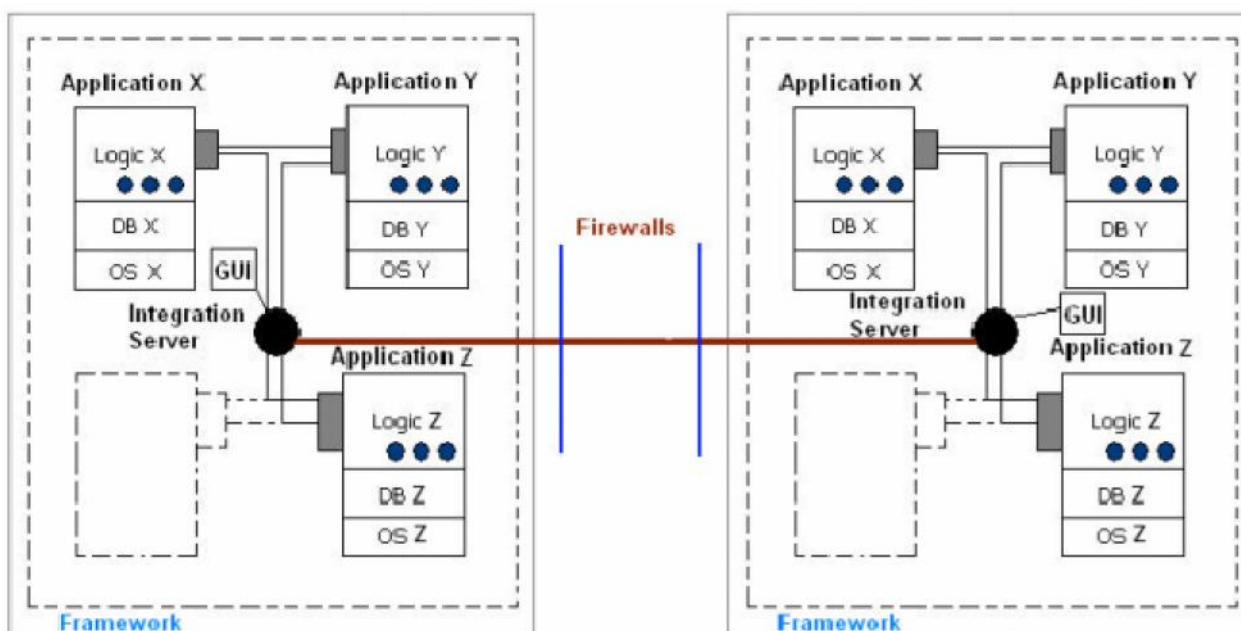
137   business processes.
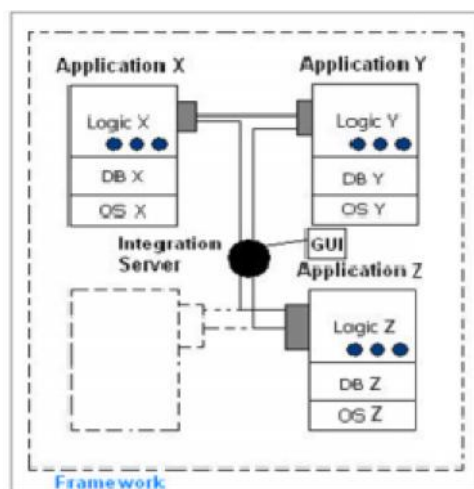
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139   **Figure 1.2 Process Integration**

1.2. B2B Integration

140

141 B2B integration is basically the secured coordination of information among businesses and the
142 businesses' information systems. B2B integration solutions provide a technology framework for
143 B2B collaborative e-commerce (IBM, 2003). B2B integration promises to transform the way an
144 organization conducts its business with the different partners. Through integration of technical
145 processes and businesses, organizations can strengthen their relationships with service partners
146 and their customers, they can achieve unified integration within and beyond an enterprise, they
147 can gain real time views for the accounts for customers, they can reduce costs, and increase
148 operational efficiency. Therefore, B2B integration is the pervasive enabler of business strategies
149 such as collaborative networks, collaborative e-commerce, supply chain management, and
150 customer relationship in a multichannel delivery system including the Internet and wireless
151 devices.

152 While application integration is the integration of internal applications in an enterprise, B2B
153 *integration is the integration of data and business processes across multiple partners*. Both the
154 enterprise application integration and the B2B integration are accomplished by data, application,
155 and process integration and therefore, integration challenges in enterprise application integration
156 and B2B integration have a lot in common and a single, integrated solution can solve them.

157

158   **Figure 1.3 B2B Integration**

159   **1.2.1. Steps in building a B2B Integration Solution**

160   • *Plan* a B2B integration strategy: This involves stating clearly the business processes that
161   can be   integrated with the partners over the Internet, the benefits the migration strategy
162   will provide and the resources required. The step should also encompass evaluation and
163   benchmarking of how others have implemented b2B integration.
164   • Determine the short-term and long-term *goals*:
165   • *Leverage existing systems*: Companies should evaluate how they can keep their existing
166   internal systems while extending information systems to its partners.
167   • Choose the *right solution* and *solution provider*.

1.3. B2B Integration Patterns

169   Businesses can make use of one or more of the integration patterns to achieve B2B integration.
170   They include:-

171   • **Data oriented integration:** The integration pattern integrates data across organizations
172   through batch processes, replication, data marts, data warehouses, and data federations.
173   Data sources exist independently and their data schema may change at any given time.
174   The sources run on different platforms and provide proprietary APIs(Samtani,
175   Healey&Samtani,2002). The integration pattern attempts to eradicate the use of
176   proprietary APIs in accessing data. Data from disparate internal data sources can be
177   accessed over an intranet and external data from various partners through a standard
178   interface.
179   Data oriented integration allows businesses to publish and share corporate data over the
180   internet regardless of their networking platforms, operating systems, or database systems.
181   The integration also supports unified information views to all the partners and update
182   across their systems.
183   • **Application oriented integration:** The integration pattern integrates distributed
184   applications by invoking the exposed interface of each of the organizations through
185   standard mechanisms such as APIs and RPCs. The pattern involves direct application-to-

186   application integration across organizations and across platforms over a network.

187   Application to application integration requires new and old technologies to integrate thus

188   realizing a common architecture thus allowing applications among businesses to connect

189   and coordinate data and events(Samtani, Healey&Samtani,2002).

190   Application oriented integration is based on request/reply interactions between clients

191   and the server. The middleware, therefore, must provide the adapters supporting

192   synchronous program invocation.

193   For a successful implementation of this pattern, organizations must give away autonomy

194   and develop applications cooperating with their partners closely. To make any changes,

195   informing and coordinating with the other partners is unavoidable. This makes the pattern

196   least inflexible rendering the pattern very expensive. The pattern also requires

197   authenticating strictly before executing functions and methods.

198   • **Portal oriented integration:** This integration pattern presents a consistent web interface

199   or presentation layer for major applications and major business processes to a user in any

200   organization in a personalized and a secured way. Portals provide web front-end that

201   supports key business functions that involve business transactions and sharing of

202   information between different partners, service providers, departments, employees, and

203   customers(Samtani, Healey&Samtani,2002). Through portals, secure and single point

204   interaction with diverse information, processes, and people is possible. Users use a web

205   browser to access and interact with applications that a company hosts. The content and

206   the data that is accessed reside virtually anywhere.

207   In B2B integration, web portals provide a quick and efficient way of establishing and

208   maintaining the relationships in a business and all interactions are done through

209   personalized services thus adding value to them. Partners can collaborate through portals

210   by engaging tools that help cross-organizational teams to communicate and work

211   together. The portals allow for partners to get information regardless of the distance

212   between partners and at any time.

213   However, in most cases, portal oriented integration does not achieve full B2B integration

214   as most portals do not have sophisticated tools for management of business processes.

215   Most of them lack tools that allow data to be transferred based on business events

216   automation.

- **Business process oriented integration:** The integration pattern integrating internal and external business processes that spread across multiple organizations. The integration pattern aims to implement integration based on rules of the business in order to improve business efficiency.

  The pattern includes logic and reasoning of doing business. It removes the limitations of data oriented and oriented integration patterns by focusing on business processes and not only the data(Samtani, Healey&Samtani,2002). To achieve this pattern, organizations must involve design, model, automation, execution, and monitoring of the business processes. An instance of business process integration may involve multiple application and data integration at different levels and involving multiple steps.

1.4. Benefits of B2B Integration

a) Dynamic business relationships: B2B integration allows quick and flexible response of dynamic business relationships and processes as business models and customer demands change. Through B2B integration, business can bring into their range new associates and automate business processes across enterprises in an easier, faster, and safer way.

b) Real-time information across partners: Through B2B integration, businesses can exchange real-time, task-specific, and partner-specific information over the Internet in a secure way. The organizations benefit from the' power of now'. It gives companies the 'power of now'.

c) Lower transaction costs: B2B integration enables businesses to reduce transactional costs and the complexity associated with manual transactions while they maintain complete business logic.

d) Participation in online marketplaces: Through B2B integration, companies can build digital market places and participate in multiple horizontal and vertical market places. This cuts transactional costs, cuts production and inventory costs, and reduces exceptions and other errors.

e) Streamlining of business operations: Through B2B integration, companies can automate, reshape, and improve their business processes' efficiency through business process management. The integration automates inter personal, inter-functional, and inter-organizational activities of the business processes.

1.5. Challenges of B2B Integration

a) Internal application integration: A major challenge in B2B integration is the integration of information among internal enterprise applications. Since B2B integration is accomplished through multiple application systems, organizations must first integrate their internal applications before implementing the B2B integration plan.

b) Disparate internal corporate data: When application data in organizations is scattered across several databases, internal application integration becomes very complex.

c) System heterogeneity: For large companies conducting business with various partners, the internal and external system heterogeneity is a big task. The organization's IT infrastructure comprises of multiple applications running on multiple platforms. Additionally, each of the partners is in a similar situation. This provides a complexity and difficulty in integrating the technologies for heterogeneous and distributed system for B2B integration.

d) Data security: Businesses need to find a complete B2B integration solution to link their systems with those of their partners quickly, bring guaranteed delivery, transaction traceability, and secure communications over the Internet. The transactions mostly involve high value and sensitive data and therefore, there is a lot at stake making the issue of security is extremely important.

e) Transaction integrity: Transaction integrity is the degree to which a transaction flowing through a network reaches its destination without diminishing of its meaning, content, or function. Since B2B applications are distributed across many organizations, maintaining transactional integrity is a major challenge.

f) Process differences. In organizations different processes are handled differently even f in the same industry.

1.6. Approaches to B2B Integration

Manual B2B Integration

Manual B2B integration is the integration process involving personnel (e.g. employees or customers) to act as the interfaces between business to business applications and thus facilitate

276 their integration (Jones, 2011). Manual integration could be in the form of the collection of
277 information and entry of the information in multiple systems and consequently reading
278 information from those systems to respond to different business needs. In other cases, an
279 employee may have to get information from the database of one business, and then provide it to
280 an employee of the other business to enter it into the other business' database so that the business
281 can use the information. This form of integration requires very little technology investment.
282 However, manual integration has the following drawbacks:

283 • The manual integration approach is highly inconsistent and lacks scalability which poses
284   a high probability of inaccuracies in data
285 • When there are many businesses involved depending on the same data, the integration
286   becomes more complex
287 • As the complexity and the amount of data needed by a business and its partners increases,
288   or as the number of applications using the same data from different organisations
289   increases, organizations will require more and more people to maintain such manual
290   integration environment.

291 An environment relying heavily on manual integration is very inefficient, and restricts growth as
292 opposed to more automated techniques.

293 **Partially Automated Interconnection B2B Integration**

294 Partially automated B2B interconnection integration combines both the human effort and some
295 automation (Jones, 2011). The integration may involve a person in an area where the
296 corresponding automated solution is too expensive or difficult, or where the businesses requires a
297 human decision. In other parts, the systems between different businesses are usually
298 interconnected through a network.

299 Partially automated technique requires more technology investment as compared to manual
300 integration. However, once the businesses make the initial investment, the number of people
301 involved in integrating the different businesses' applications is often reduced. This reduction on
302 human involvement in this manner usually reduces costs and increases reliability.

303 Partially automated B2B integration is still not efficient enough, since it still requires the
304 intervention of some people in the middle of the process, for instance the need for human
305 intervention to transform data that is required in another system.

306 **Fully Automated interconnection B2B Integration**

307 Fully automated B2B interconnection integration removes people from the businesses process
308 entirely, although the process requires them to maintain the solution. Fully automated
309 interconnection his type of integration consists of applications and systems between different
310 organisations communicating through a series of interfaces and adapters (Jones, 2011). For
311 example, two databases from different organisations might share data, which is then
312 automatically transformed and committed to the second database from the first without human
313 interaction. Fully automated B2B integration removes the dependency on people. However, the
314 systems can be more expensive to implement and may not be practical for some business
315 problems. In many cases, organisations will still require people to make business decisions, and
316 often a person controlling a technical process as well is more efficient. The praised 'fully'
317 automated B2B integration technique is arguably the reliable technique due to scalability,
318 consistency and efficiency derived in the process of sharing and exchanging business data.

319

1.7. B2B Integration Components

321 B2B integration has multiple components with differing priorities depending on the involved
322 organizations. Whereas it might be hard to incorporate all the B2B integration components in the
323 first phases of implementation, including majority of them at least in the long term B2B goals is
324 important. The most important B2B components include XML, the Middleware, integration
325 brokers, and wireless technologies.

326 **XML**

327 Extensible Markup Language is a technology that is based on open standards and aims to
328 standardize   and   simplify   processes   communication   among   organizations(Samtani,
329 Healey&Samtani,2002). It provides an open platform for organizations to communicate over a

330   network and thus it enables the dynamic 'anywhere-to-anywhere' interactions of businesses.
331   XML is the universal language, which makes data over a network meaningful and thus enables
332   different systems to recognize the data easily and allows for easy exchange of contents and
333   business documents. XML in B2B applications allow trading partners to avoid the cumbersome
334   process of mapping the other businesses' process into complex electronic data interchange
335   messages. Businesses incorporating B2B integration must have XML-centric business processes
336   and their structure must support XML standards, enable process transformations, provide
337   applications links.

Middleware

339   Middleware is the software layer between the client and server applications providing a uniform
340   channel for the applications to communicate with each other(Samtani, Healey&Samtani,2002).
341   Middleware provides the platform that allows applications developed in different languages and
342   installed on different operating systems and data sources from different vendors to integrate.

Integration Brokers

344   Integration brokers are interface engines between two different third-party systems that provide
345   adapters for converting data to and from various third-party formats(Samtani,
346   Healey&Samtani,2002). Integration brokers contain message brokers, which are built on top of
347   messaging middleware and provide intelligent translation and routing message from the source
348   application to the target application. Message brokers enable content based, conditional, and
349   sequential routing of messages. Message brokers also function as message warehouse that stores
350   raw unprocessed messages for retrieval and archiving.

351   In B2B integration, integration brokers will enable the businesses achieve reliable and faster
352   integration. The brokers provide adapters for servers, packaged applications, legacy applications,
353   and databases. They also support all open standards and enable applications to communicate
354   irrespective of the protocol for communication. Integration brokers link applications both within
355   an enterprise and across business to business networks.

357 **Wireless Technologies**

358 Organizations need to provide their employee's and partners access to computing resources
359 anywhere they might be. The access is not completed if it is limited to basic features such as
360 emails. It should include hookup into applications enabling them be productive anywhere at any
361 time. Therefore, there is need for a solution that extends internet, intranet, and extranet
362 applications wirelessly to handheld devices and phones. Integrating mobile devices with the
363 internal and trading partners' application is an important part of B2B integration.
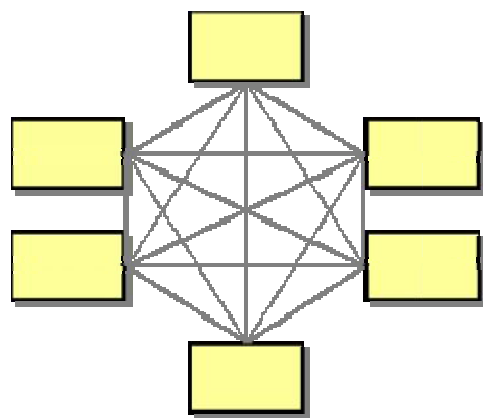
3. B2B Integration Architectures

365 B2B integration can be supported by different architectures. One of the factors that determine the
366 architecture to be adopted is the *number of connections* to be made, that is the *number of*
367 *businesses to be interconnected*, the *size of those businesses*, and the *number business processes*
368 *that need integration* in those businesses (Samtani, Healey&Samtani,2002). Some architectures
369 work efficiently when there are a few processes or applications to be integrated. However, as the
370 number of processes/applications increase, alternative architecture is necessary. That is why we
371 propose the process to node architecture.

372 An important part of making B2B integration scalable is to increase the level of automation and
373 reduce human intervention. This has made fully automated B2B integration more viable,
374 scalable, and efficient as compared to the manual and semi-automated integrations. This
375 generally involves creating interfaces between businesses' systems along with predefined logic
376 that replaces the involvement of human beings. The choices for automated B2B integration
377 discussed in this paper are:

378   **a. Point-to-Point Integration**

379 Point-to-point integration is the pair-wise integration of different organisation's back-end
380 application systems. Every back-end application system in this architecture has an established
381 direct data transfer to transport messages between two connected back-end application
382 systems(Ramblings, 2012). An integration software mines data form one back-end application
383 system and transports it to the other back end application in which it is connected to.

384　Point-to-point integration may involve synchronous communication or asynchronous
385　communication. In synchronous communication, the software system extracts data from a back-
386　end application and invokes the other application synchronously to insert the data in it. Data
387　transformation on the data occurs after the extraction but before being taken to the receiving
388　application. In asynchronous communication, data is stored in an intermediary storage after
389　extraction where the integration software retrieves it from and inserts it to the receiving
390　application. The intermediary storage in asynchronous communication acts as an integration
391　buffer that mediates extraction and insertion speed and isolates application systems from each
392　other enabling application independence. Instead of intermediary storage for asynchronous
393　communication, persistent queues may be used. Where persistent queues are used, de-queuing of
394　messages is in the order in which they were queued.

395

Figure 3.1 Point-to-Point Integration

397　　　**b. Hub-and-Spoke Integration**

398　In a hub-and-spoke architecture, applications communicate through a central intermediary, called
399　a hub. The applications that are integrated in this architecture are known as spokes, and each
400　spoke communicates with the hub which then manages the communication with the other hubs
401　(Ramblings, 2012). In this case, application systems do not communicate with each other
402　directly. The hub performs the tasks of routing and passing data. The spokes only need interfaces
403　and connections to the hub.

404　In this case, adding application systems or making changes to an application system do not have
405　any effect on the other application systems. This offers the hub-and-spoke architecture its main

406 advantage, which is scalability. In comparison to the point-to-point approach, hub-and-spoke

407 architecture can support a larger amount of application systems easily and requires less

408 maintenance. However, the architecture has an added initial complexity of setting up the

409 middleware and converting existing applications to use the middleware APIs. A major drawback

410 of hub-and-spoke is the centralized nature. If there are network errors and connectivity to the hub

411 is down, then the all system comes to a standstill as no application will be able to communicate

412 with each other. However, a clustered solution where different machines run multiple instances

413 of integration brokers would avoid a situation where all the system goes down because of

414 connectivity problems to the broker.

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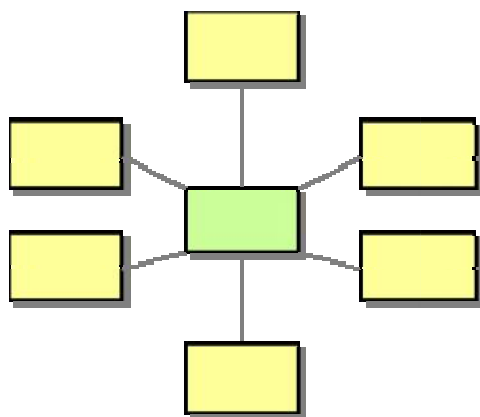
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417 **Figure 3.2 Hub and Spoke Integration**

418   **c. ASP Aggregation**

419 An enterprise, known as an application service provider (ASP) may install application systems to

420 its customers, known as subscribers. The subscribers rent access to the systems for their use. The

421 ASP hosts the application systems and subscribers can access the systems over the internet while

422 paying an access fee to the ASP. Subscribers get access to the hosted application systems

423 through a browser over the internet(Bussler, 2003). The subscriber's data reside at the ASP since

424 the application systems are part of them. If there is need to integrate local systems with the

425 hosted ones, the ASP must be involved and the integration solution reaches it through the

426 internet.

427 Many times, application systems of a business cannot be hosted by one ASP and they have to
428 work with other. Therefore, the business must coordinate with different ASPs at the same time to
429 integrate their hosted applications and inter-business applications. ASP aggregators provide a
430 single point of management for the hosted applications, whether within the business or inter-
431 business. ASP aggregators are service providers that act as gateways for other ASPs. The
432 aggregator allows enterprises to look at their hosted application systems in a homogenous
433 way(Bussler, 2003). For enterprises to communicate with other enterprises, the ASP aggregator
434 provides the integration functionality through its B2B integration server and therefore, provides
435 inter-business integration.

436

437   **d. Hosted Integration**

438 Hosted integration is a variation of the B2B aggregator integration. In this architecture, an ASP
439 does not host application systems for various businesses. The application systems are installed
440 locally at the businesses and an ASP will host an integration technology server. The ASP must
441 then define integration for the various businesses concurrently on the same installation(Bussler,
442 2003). Each of the businesses do not need to maintain its own integration server installation and
443 the single installation provides the communication needed by the partners realizing a B2B
444 integration.

445   **e. Reverse Hosting**

446 In reverse hosting, an ASP installs the integration software at the subscriber's side instead of in-
447 house. The subscriber is under full control of the data the integration software manages.
448 However, the ASP manages the integration software. Therefore the subscriber outsources
449 integration software management but retains full control of the data and the hosed
450 software(Bussler, 2003).

451   **f. Service Oriented Architecture (SOA)**

452 SOA is an architectural style that guides creation and use of business processes, which are
453 packaged as web services, throughout their lifecycle. It defines and provides the IT infrastructure

454   allowing different application systems to exchange data and participate in business processes
455   regardless of the programming languages or the operating systems underlying the systems
456   (Durvasula, 2006)[1]. SOA represents a model in which functionality is decomposed into small,
457   distinct unit known as services. These services are distributed over a network and their
458   combination is reused to form business applications. By passing data from one service to
459   another, the services are able to communicate. They can also communicate by coordinating an
460   activity between the services (Bussler, 2003). SOA consists of service and event interfaces to
461   both legacy systems and newer applications that are built on top of platforms.

462   SOA architecture encourages creating loosely coupled business services by integrating disparate
463   applications regardless of their underlying technologies. SOA's one key goal is to maximization
464   of the reuse of application-neutral services in order to increase business and IT efficiency and
465   adaptability. SOA incorporates a style that supports loosely coupled services efficiently thus
466   enabling business flexibility in an interoperable, technology skeptical manner (Bussler, 2003).

467   Also SOA consists of a composite set of business services that support a flexible delivery model
468   with dynamically re-configurable end-to-end business process realization using event-driven,
469   interface-based service descriptions (Erl,2005).It provides the ability to invoke remote business
470   services and install them as local components in a different application, all without writing a
471   single line of low-level code.

472   SOA contains three main components, namely: Service provider, service broker, and a
473   subscriber. The service provider is responsible for creation and publishing of the service
474   interfaces, provision of the actual services, and provision of responses to any use of the services.
475   Service brokers are responsible for the registration and categorization of the public services by
476   service providers. Service brokers also offer search services for users to search for the registered
477   service providers and what they offer. Subscribers or the service requester are the actual users of
478   the services and they subscribe the services from the service providers (Durvasula, 2006)[2].
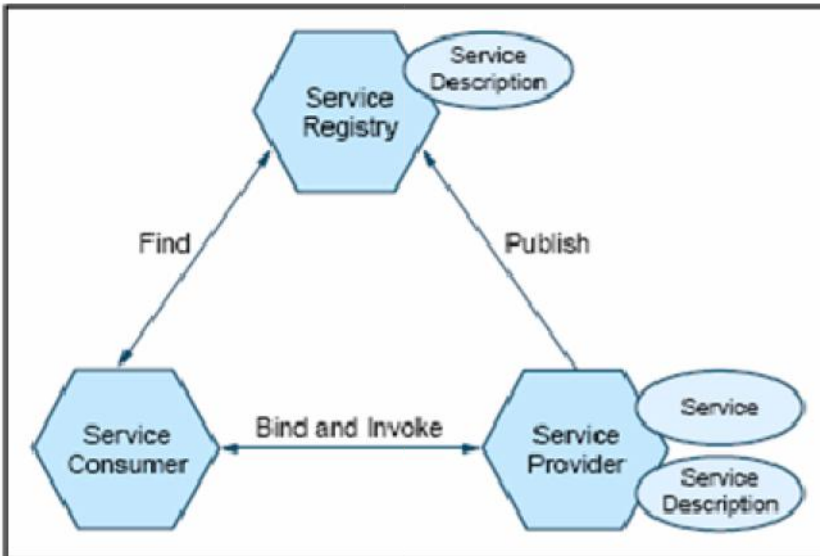
479

480 **Figure 3.3 SOA components**

481 <center>**ANALYSIS AND SUGGESTIONS**</center>

482 Traditional integration methods are great and have worked wonderfully especially messaging.
483 Most common integration practice is to achieve short-term ad-hoc objectives by creating
484 dedicated point-to-point links between the subsystems everywhere it is necessary. Most of the
485 links are established between components of the process and control layer, where supervisory
486 control systems receive data from plant-floor devices and subsystems.

487 After years of establishing ad hoc links, the interconnection network becomes very complicated
488 and chaotic causing that we have to deal with the following problems:

489 1. Difficult modification and maintenance – each new system will require new links making
490   the structure more and more complex and deepening chaos of communication.
491 2. Inefficiency – a lot of the associations are based on a common communication medium,
492   sometimes of a low quality, e.g. enterprise field controller network – the complex
493   structure will necessitate transferring the same data over the network many times and,
494   finally, cause a waste of the bandwidth.

495   3.   Costs – if communication is based on the third-party toll infrastructure, the fee for the

496   data transfer may be significant. Additionally, a strong dependence on the independent

497   operator increases.

498   4.   Partial interoperability –the data presentation and description at the link sink is precisely

499   suited to the systems it services and, therefore, data cannot be accessed directly by other

500   systems.

501   5.   Mess – in a real world enterprise there can be tens, hundreds or even thousands of

502   subsystems in every layer (in the figure above there are only a few components).

503   Maintenance and documentation of such a complex architecture is a real challenge for

504   administrators.

505   6.   Anarchy – if subsystems have different methods of authorization, authentication and user

506   rights management, it is almost impossible to keep an appropriate level of security. As a

507   consequence, some data can be lost because the rules are too weak or communication

508   cannot be established because the rules are too strong.

509   Often four Strategies are thought of in B2B integrations;

510   1.   Takeover and merger.

511   2.   Keep both systems, and develop them to have the same functionality.

512   3.   Replace both systems with a new one.

513   4.   Select the best systems from each company and combine them.

514   5.   Select one company's

CONCLUSION

517 B2B integration has many advantages; One integrated platform for all integration work, Already

518 integrated integration technologies, Service levels apply without limitation: transactions,

519 reliability, recovery, scalability, security etc.

520 I suggest developing an easy way to map a process to a node. The node can be a product, a

521 service point, a resource or even a deliverable in a business process. Thus the integrating

522 business have a clear view of the requirement on basis of a holistic picture not at some point of

523   need. Implementation can then take a combination of technologies but most importantly having

524   already identified the perfect architecture of integration - a process to node map.

525

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