

Boundaryless Information Flow Reference Architecture: Six Example Boundaryless Business Models

Version 4.0

*A Working Paper of the Boundaryless Information Flow
Reference Architecture Project by:*

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Six Example Boundaryless Business Models

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Six Example Boundaryless Business Models

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Table of Contents

Executive Summary	1
Introduction	2
Background	2
Goals for the Boundaryless Information Flow Reference Architecture	2
Business Models Demand IT Response	4
Generic Business Strategies	5
Generic Enterprise Structures	5
Generic Forms or Patterns of Boundaryless Information Flow	6
Models of Business Boundarylessness	7
Strategic Decision Support	8
Retail Sales Boundarylessness	12
Relationship-Based Retail Services	15
Online Publishing	18
Supply Chain Automation	21
Interpersonal Interactions	27
Contributing Common System Architectures	31
Workflow Management Architecture	31
Messaging Architectures	32
Security Architecture	32
Directory Architecture	32
System Management Architecture	33
Information Architecture	33
User Interface and Ontology Architecture	34
Transaction Management Architecture	34
Other Contributing Architectures	35
Summary	36
About the Author	37
About The Open Group	37



Boundaryless Information Flow achieved through global interoperability in a secure, reliable, and timely manner

Executive Summary

In 2002, The Open Group updated its vision to be “Boundaryless Information Flow achieved through global interoperability in a secure, reliable, and timely manner.” In January 2003, a White Paper was published entitled *Boundaryless Information Flow Reference Architecture*, which was produced to help The Open Group membership engage in efforts to achieve this vision. The *Reference Architecture* document presented a framework to elicit specific contributions.

That document discussed the business models and drivers that affect an organization’s need for Boundaryless Information Flow, and that should shape the technical approach taken to achieve the benefits of boundarylessness. It also described some of the parts of the generic IT architecture—the Common System Architectures, such as messaging, security, and information architectures—that contribute to and define different forms or styles of Boundaryless Information Flow.

This document continues the effort of the *Reference Architecture* document. It identifies a number of specific business models of Boundaryless Information Flow. Each model is described in terms of the business objectives addressed by Boundaryless Information Flow, the constraints under which it must be accomplished, and other considerations that are specifically relevant. For each of these business models, the Common System Architectures are identified that are most significant to shaping IT solutions to meet the model, and which are themselves most needful of being shaped to the business.

This White Paper is intended to elicit from IT technology and solutions providers specific technologies, standards, products, and architectural elements that address each business model. Such offerings will, in later work, be analyzed, compared, and synthesized into a number of targeted architectures to help enterprises achieve business models of Boundaryless Information Flow at reasonable cost, and with a high degree of reliability and confidence.

Introduction

Background

Organizations that choose to move toward the Boundaryless Organization¹ to improve their operational effectiveness are finding Information Technology resistant. The Open Group is seeking to help organizations address that resistance, thereby achieving Boundaryless Information Flow in support of their movement toward the Boundaryless Organization.

Boundaryless Information Flow represents the vision that The Open Group is pursuing. This document takes a step toward that pursuit by providing a framework to elicit, evaluate, and position necessary architectural contributions for **Boundaryless Information Flow**.

Goals for the Boundaryless Information Flow Reference Architecture

The Open Group *Boundaryless Information Flow Reference Architecture* is a guide for practicing IT architects, helping them direct their clients to effective business solutions using IT. But we believe that a reference architecture can do more than that, and be more broadly and more directly useful to end-users.

Specifically, an IT architecture defines the components or building blocks that make up an overall information system that would meet the business objectives addressed by the architecture. It provides a plan from which products can be procured, and specific systems developed or adapted so that they will work together to efficiently achieve the goals of the adopting organization. It enables customers for IT to manage their IT investment in a way that meets the genuine and specific needs of their businesses. The Open Group intends the Boundaryless Information Flow reference architectures to assist end-users in making informed and appropriate choices in their IT procurements.

Well-constructed reference architectures that describe and address well-articulated, coherent sets of business requirements can also assist the suppliers of IT systems in the design, construction, tailoring, and marketing of their software and system products. The Open Group approach to the creation of technology guidance is bi-directional, soliciting contributions from the users of IT as much as from the vendors. The Boundaryless Information Flow reference architectures will combine the user's view of business objectives and senior technologists' understanding of how such objectives can best

¹ *The Boundaryless Organization: Breaking the Chains of Organizational Structure*, by Ron Ashkenas *et al.*

Six Example Boundaryless Business Models

be addressed in an interoperable, standards-oriented manner. This will assist vendors in creating products that genuinely meet specific business objectives.

Finally, we hope that well-constructed reference architectures, having improved the mutual understanding of customers and vendors, and guided developers and integrators to the creation of better solutions, can also serve as the guide by which technology products can be recognized for their appropriateness for boundaryless enterprises. It is to be hoped that, as the reference architectures contemplated in this document are accepted, they may form the basis of a “branding” or “seal of approval” that will assure customers of an architecturally sound, standards-based IT product that will meet their genuine business needs in an efficient and effective way.

Business Models Demand IT Response

It is widely observed—nearly a part of conventional wisdom—that IT systems must be fitted to the organization and goals of the enterprise employing and deploying them. Similarly, there is no lack of advice to business managers that they should be aware of the impacts and opportunities represented by new IT, and be prepared to reshape their companies to exploit technology, lest their companies be reshaped by their more technologically-astute competitors.

For all that recognition of the inter-relatedness of the structures and strategies of businesses and the form and capabilities of IT, there is very little specific guidance available to allow a purchaser of IT to find those solutions that will best fit and serve his organization and its strategies.

In the *Reference Architecture* document we discussed the *Continuums of IT Architecture* that are key to the TOGAF approach. The business domains of the Continuum extend in two dimensions:

- In one dimension, architectures differentiate by the line of business they address.
- In the other, architectures become increasingly specific, addressing the needs of smaller and smaller entities.

This reflects the fact that, traditionally, business-driven IT architectures have been developed either for vertical industries or for specific companies, and have been narrowly applicable.

More broadly applicable IT architectures have usually been driven from the technical space. Some of these architectures were developed to take advantage of new technologies (as networked services and all they implied developed to take advantage of local area networking and, eventually, the Internet). Other technology-driven architectures arose from the need to make the use of IT easier or more efficient.

While both of these sorts of architecture can be of benefit to business, they do not address business needs directly.

The Open Group Boundaryless Information Flow initiative is focusing specifically on the benefits to business that new, ubiquitous, and seamless technologies can provide. In this document we will look at specific forms, models, or patterns—pick the term you like best—of Boundaryless Information Flow that address specific business needs.

*Specific IT architectures
for specific models of
business*

*A call to action:
follow through with
“actionable”
reference
architectures*

Six Example Boundaryless Business Models

Fundamental business models influence IT choices

Generic Business Strategies

Generic business models or strategies describe the ways in which enterprises approach doing their business and, more specifically, how they do business in ways that get them an appropriate competitive advantage. There are many ways to identify and classify business models. Porter's "three generic competitive strategies" is a frequently used model. Boston Consulting Group's "quadrant model of stars, cows, and dogs" is another approach to describing corporate business strategy. IT choices made by a company should be appropriate to the company's strategy, no matter how it is analyzed. We discussed this in some detail in the *Reference Architecture* document.

Generic Enterprise Structures

We also discussed the structures that organizations can adopt and their relation to IT strategy. We described business planning as a form of technical architecture, analogous to network architecture, information architecture, and systems architecture in its role in planning significant IT deployments and procurements. Although they are not commonly called "architects", business planners, when they analyze and plan the structure of businesses, use methods similar to those used by IT architects. The business structures they create are certainly key inputs to an IT architecture.

Especially in the context of creating Boundaryless Information Flow architectures, it is essential to consider how well the structure of a company will support the goal of boundarylessness. In some cases becoming "boundaryless" means encompassing more business activity within the structure, or extending the scope of existing boundaries to include more partners and clients. Making an organization into a Boundaryless Organization takes more than just an IT procurement. For the technology to be successful, the organization must break down the boundaries that impede the adoption of boundaryless IT, and it must break down the boundaries that will impede the use of the technology once it has been deployed.

Certainly this does *not* mean that business should be driven by technology. Where the Boundaryless Organization business model addresses the human factors, Boundaryless Information Flow addresses the computer actors and therefore Boundaryless Information Flow can be seen as a tool to support the Boundaryless Organization. If the goals of the organization and the goals of the technology aren't well aligned, neither will likely reach their full potential.

Six Example Boundaryless Business Models

Generic Forms or Patterns of Boundaryless Information Flow

In this document we emphasize a different way to “classify” or characterize business requirements for IT. Rather than looking first at a vertical industry classification, competitive strategy, asset or portfolio management classifications, or organizational structure, we will look at the scope of boundarylessness that might bring benefit to the enterprise, and the specific business objectives and constraints an implementation of that boundaryless environment must address. In some cases, the models we describe here may appear to represent a vertical industry. (This is especially true for the Online Publishing model, for example.) That is not the intent; rather, each model should be considered a style of business that is applicable in many vertical industries, and for businesses with a variety of strategies.

Models of Business Boundarylessness

Boundaryless Information Flow architectures, like all IT architectures, are built of “sub-architectures”. Sub-architectures address specific aspects of the overall IT architecture, such as security or messaging. Each *type* of sub-architecture may, in practice, be represented by several different specific architectures or architecture styles. For example, data management may be done using centralized architectures or distributed architectures; messaging services may be implemented in peer-to-peer or client/server architecture models or styles.

*Some common forms of
boundarylessness*

A comprehensive architecture, such as a Boundaryless Information Flow Reference Architecture, is made of selected forms of these sub-architectures. For many classes of sub-architecture, there are examples that would be better suited for inclusion in an overall architecture, based on that architecture's objectives.

In creating Boundaryless Information Flow reference architectures, we need to identify the specific forms of each sub-architecture that are best suited to achieve the goals of boundarylessness. Other forms of these sub-architectures that are better suited for other objectives may also be identified for purposes of comparison, or to show how other objectives may be accommodated within an architecture primarily seeking boundarylessness.

In the following sections we describe several examples of boundarylessness. Each is important from a business perspective. All of them are models that need the support of IT. And each one is meaningfully different from the others in the IT solutions that most directly support them. We believe each of these models of boundarylessness is the driver for a specific Boundaryless Information Flow reference architecture.

Six Example Boundaryless Business Models

*Creating the learning-
driven,
intrapreneurial
enterprise*

Strategic Decision Support

“The ultimate competitive advantage lies in an organization’s ability to learn and to rapidly transform that learning into action. It may acquire that learning in a variety of ways – through great scientists, great management practices, or great marketing skills. But it must rapidly assimilate its new learning and drive it.”²

The real innovation that has spawned success at GE is when Welch realized that “someone, somewhere, has a better idea”. What this allows the company is not only to share and implement ideas across business units, but within industries and nations as well. The ability to recognize and act on these better ideas—to appropriate them to the company regardless of where they originate—is the defining characteristic of this sort of boundaryless enterprise. The boundary that is removed is the boundary that separates “here” from “there”, rendering meaningless the expression “not invented here”.

Scope

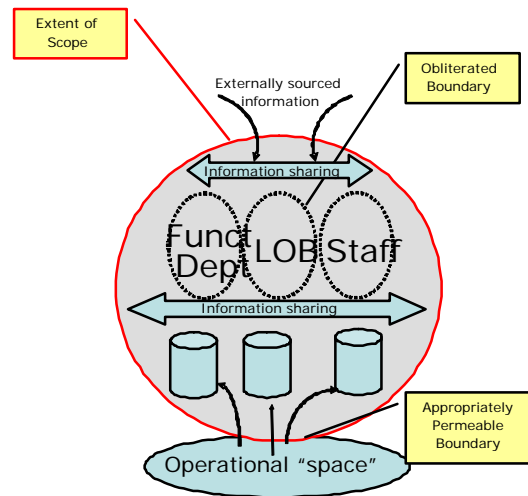
The scope of boundarylessness required for the Strategic Decision Support model exists *within* the corporate environment and includes:

- Individuals involved in strategic planning according to the company’s model
- Information pertaining to company strategy and performance:
 - Historical information on performance
 - Current operational, financial, and other corporate information
 - Forecasts of sales, profits, marketing plans, and other information describing the company's future
- Competitive position information
- “Better ideas”, whatever the source

² Jack Welch, quoted in *Jack Welch and the GE Way*, Slater, Robert, New York, McGraw Hill, 1999.

Six Example Boundaryless Business Models

Figure 1:
The Boundaryless Scope of
the “Learning” Enterprise



Objectives

The objectives of this form of boundarylessness are:

- Promote competitively advantageous attitudes and behaviors:
 - Intrapreneurship
 - Learning culture
 - Idea exchange
 - Thinking
- Provide all participants in the corporate strategy access to all information on the corporation's position, and the means to analyze that information and share the results with all members of the corporation
- Information “outside” the scope is brought inside and made available to the participants:
 - Operational information
 - Internally-initiated “suggestions”
 - Competitive intelligence
 - Externally-generated “better ideas”
- The boundaryless environment makes it possible for all information available to be had in the forms necessary and appropriate for their use (no “language” boundaries)
- Historical information is readily available (no temporal boundaries)

Six Example Boundaryless Business Models

Constraints

Implementations of this sort of boundaryless environment must meet the following constraints:

- Information must be available on a timely basis.
- Data collected from other domains (e.g., operational) should be available within hours.
- Information and analyses created within the scope should be instantly available.
- Users can select sets of information that are internally consistent and coherent
- All users will see the same information, and be guaranteed that it's correct
- Appropriate controls for privacy, fiduciary responsibility, trade secrets, etc.
- Authorization to access company-sensitive information must be controlled on a fine-grained basis, and administrable on a short time constant.

Additional Considerations

This model is motivated primarily by the desire to foster attitudes and enable behaviors that will make the company more agile, insightful, and competitive.

Cost reduction is one anticipated consequence, but is not a primary driver for this model.

A primary objective is to remove the boundaries and barriers that prevent decision-makers from learning from competitors. While it may be good for competition and good for the public, it is not an objective of the organization implementing this sort of boundarylessness to help its competitors learn from it. In fact, if this sort of boundarylessness is a virtue to be encouraged, no organization ought to be able to get the benefit of a competitor's Boundaryless Information Flow unless he has also undertaken to remove his boundaries.

How much of the company is involved in strategic decision-making is a matter of governance and culture. Some organizations seek a flat organizational structure; others are more hierarchical, involving fewer employees in strategic decision-making. In some senses a flatter organization is more of a Boundaryless Organization, but this model needs to be deferential to the company's own determination about inclusion.

Six Example Boundaryless Business Models

- But employees not included within the “boundaryless” scope must still be well-integrated into the company.
- The virtual suggestion box should be emphasized.
- Outbound communication by strategic management to the entire company must be supported both by the IT, and by a corporate commitment to boundaryless transparency.

Key Common System Architectures

- Workflow Management
- Messaging
- Information
- User Interface and Ontology
- Collaborative Work

Six Example Boundaryless Business Models

Retail Sales Boundarylessness

Retail Sales is the business of making sales of specific goods (this includes goods that can be delivered electronically), and delivering those goods to the customer. Important in this model is the fact that the goods belong to the vendor until they are paid for; after that they become the customer's.

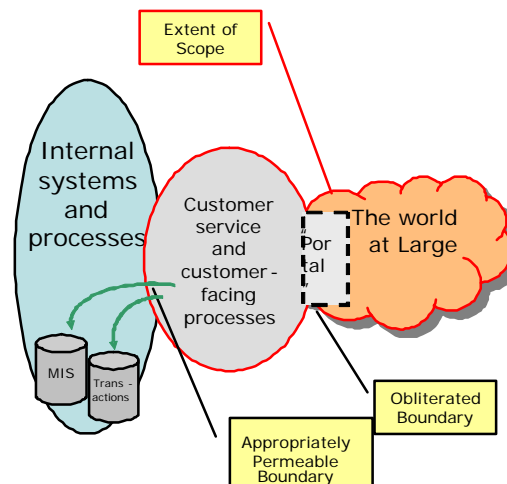
Scope

This boundaryless environment encompasses:

- Within the parts of the company servicing retail customers, extending to the Internet or other external communication environment
- All actual and potential customers and the customer service staff
- Information about products, prices, availability, etc. (boundaryless)
- Some information about customers, orders, shipping dates, accounts status, etc. (with restrictions)

Expanding the universe of customers, reducing transaction costs of sales

Figure 2:
Including the customer



Objectives

The objectives of Retail Sales Boundarylessness include:

- Increase the number of potential customers effectively reached by the company
- Improve the success of selling to potential customers by:
 - Easing presentation of product benefits

Six Example Boundaryless Business Models

- Presenting the potential customer with a wider variety of sales inducements
- Improve retention of customers and repeat business by:
 - “Engaging” the customer to establish a bond of loyalty
 - Reducing the customer’s sense of “distance” from the company
- Reduce the cost of sales by inducing the customer to perform more “self-service” without increasing – and preferably decreasing – the customer’s sense that self-service is a burden
- Gather as much information as possible from and about customers and their buying habits and preferences for use in corporate planning and strategy

Constraints

These constraints or limitations must be respected:

- Elimination of boundaries must not expose from one customer to another information that the customer would not have shared.
- Customers and potential customers must be able to create “boundaries” around their “personal space” so they aren’t alienated by excessive intrusiveness of the company or its IT.
- Information must be transferred to “internal” systems:
 - Without requiring that all internal systems be “re-architected”
 - Without exposing internal systems to “external” risk
 - In an appropriately timely manner
 - Without loss or “damage” while it waits to be transferred

Additional Considerations

See “Relationship-based Retail Services” for more considerations.

Six Example Boundaryless Business Models

Key Common System Architectures

- Workflow
- System Management
- User Interface and Ontology
- Transaction Management

Six Example Boundaryless Business Models

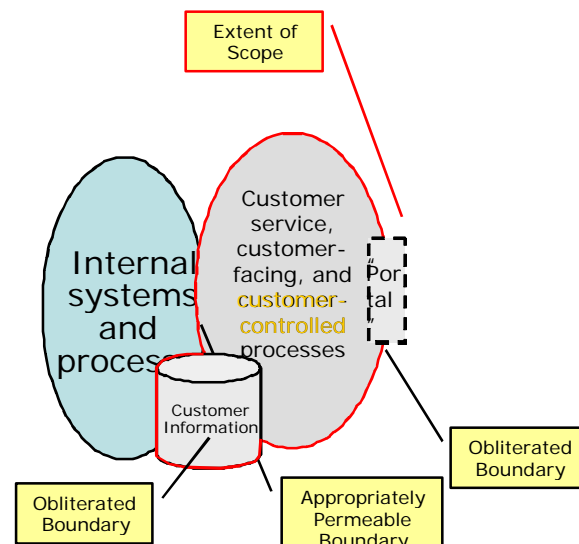
Relationship-Based Retail Services

Many companies engage in the retail provision of services. Sometimes these services are “one-shot” affairs, where each time a service is provided to a customer it represents a new sale. These services are very much like tangible goods in the relationship between the seller and the buyer. The client relationship is created and nurtured to help the seller make the next sale.

Relationship-based Retail Services are different. These services are provided on an ongoing basis within a relationship. These relationships often include the service provider taking custody of tangible assets of the client. Banking and brokerage arrangements are primary examples of these sorts of relationships.

Where the transaction is a relationship, and the relationship is the product

Figure 3:
Relationship-based services are more inclusive



Scope

The scope of this boundaryless environment includes:

- The parts of the company (directly) servicing or interacting with retail customers and the Internet or other external communication environment(s) used by current and potential customers
- All actual and potential customers and the customer service staff
- Information about products, prices, availability, etc. (boundaryless)
- Some information about customers, orders, shipping dates, accounts status, etc. (with restrictions)

Six Example Boundaryless Business Models

Objectives

The objectives of the Relationship-based Retail Services model of boundarylessness include:

- Allow clients seamless access to information about and control of their accounts and the assets included in those accounts
- Allow clients to tailor the processes applied to their accounts and the account contents
- Allow clients to add “stuff” to their accounts, exchange sorts of “stuff”, and, as appropriate, take “stuff” out of their accounts
- Allow the client to perform these and other self-service functions in such a way that the client not only doesn’t feel burdened, but rather feels included in or bound to the company
- Provide a significant capability for personalization, including explicit configuration by the client, and heuristic or other forms of preference anticipation

Constraints

Constraints on the implementation and use of this model of boundarylessness include:

- The clients' assets will usually be outside the scope of the boundaryless environment, in recognition of the company’s obligations as trustee or fiduciary.
- Clients’ control over their accounts and the accounts’ contents must often be supervised or constrained to ensure that their actions are appropriate; this is frequently a legal or regulatory obligation on the company.
- Customers should be able to use the decision support features of the system while retaining decisional privacy. That is, clients should be able to do “what if” analyses without others knowing what options they considered.
 - Some companies in some business contexts may choose to discover their clients' decision processes in order to assist them in subsequent analyses. While legitimate, this does remove a privacy boundary, and obliges the company to disclose the fact.
- Personally-identifiable information must be appropriately protected.

Six Example Boundaryless Business Models

- Service providers must be able to satisfy their fiduciary obligations to protect the clients' assets, in some cases even from the client's imprudence.
- Communications within this boundarylessness environment will often be subject to legal, regulatory, and other requirements:
 - Some communications may need to be recorded for audit and regulatory environments.
 - Some sorts of communication or information sharing may be prohibited, or constrained with respect to time or timeliness.

Additional Considerations

Significant differences from the Retail Sales model include:

- The company is holding the client's assets (not just the company's own inventory), possibly on a fiduciary basis.
- The company may have a supervisory obligation.
- The client will likely have entered into an explicit agreement defining services, obligations, and liabilities.
- The client's expectations for use of personal information will be meaningfully different.
- The client relationship is explicit and its life is (in part) controlled by the presence of assets or obligations resulting from the assets having been held in the relationship at some point in the past.

Key Common System Architectures

- Workflow Management
- System Management
- User Interface and Ontology

Six Example Boundaryless Business Models

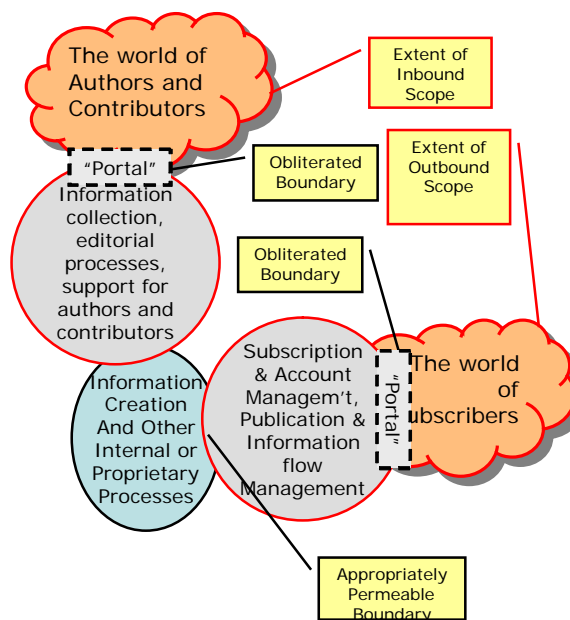
Online Publishing

Online Publishing includes the gathering of information, often from outside the enterprise boundaries of the publisher, and the provision of that information to “clients”, “consumers”, “subscribers”, or “readers”, who may have any of a number of types of relationship with the publisher.

Between these two functions lies another set of processes, which we might call the “editorial” process. This includes the “processing” of information from raw form to finished form. It also includes the publisher’s strategic decision-making, including the choice of types of material to publish, the selection of specific publications to offer, pricing decisions, and other such matters. Many of these aspects of the editorial process are distinctly private or proprietary to the publisher.

Making information more available, in more useful forms

Figure 4:
The two boundaryless domains of electronic publishing



Scope

The Online Publishing model includes two distinct scopes of boundarylessness: one for information gathering, and the other for dissemination. Those scopes encompass those parts of the publishing company that interact on one hand with information sources, authors, and such, and, on the other hand, with subscribers, readers, consumers, and the channels to them. Included within these scopes are:

- Any information (potentially) being published

Six Example Boundaryless Business Models

- Information about that information and its provisioning:
 - Availability, pricing, etc.
 - Account information

Objectives

Among the objectives of Online Publishing and its boundaryless IT environments are:

- Reduce the barriers between authors and publishers:
 - Improve the efficiency of the editorial process
 - Increase the range of authors and contributors available to the publisher
- Provide information outflow services to subscribers:
 - Increase the number of subscribers available to the publisher
 - Allow the publisher to “know the customer” and provide customized content

Constraints

Some or all of these constraints may apply to these forms of boundarylessness:

- Information should be controlled so that only subscribers to the specific information may receive it.
- The business model may require restrictions on redistribution.
- Metering of use/reception may be required.
- It may be necessary to allow multiple publishers to participate or serve the same set of recipients.
- It may be necessary to allow recipients to treat or manage all publishers in a unified or integrated manner.

Additional Considerations

The boundaryless authors’ space and the boundaryless subscribers’ space must not meet in ways that disintermediate the publisher!

“Soft” boundaries representing domains of use for intellectual property and other “rights perimeters” must be supportable within the boundaryless space without the use of physical perimeters or other discontinuities in the infrastructure.

Six Example Boundaryless Business Models

Key Common System Architectures

- Messaging architectures (especially “publish and subscribe”)
- Security (especially “digital rights management”)
- System management (especially accounting and licensing)
- Information

Six Example Boundaryless Business Models

Supply Chain Automation

The Internet makes it possible for organizations to locate and deal with potential suppliers anywhere in the world. Conversely, it lets suppliers find organizations to which they can offer their raw materials or intermediate goods. These facts introduce opportunities for market forces to help create efficiencies and competitive opportunities.

*Capturing the benefit of
lowered transaction costs*

In some senses, the ease with which supplies can be located and acquired using the Internet (together with a variety of other late-twentieth century infrastructural and technological advances) reduces the need for vertically integrated organizations that arose in the late nineteenth century and continue to this day in some industries.

This disintegration of large enterprises—especially but not exclusively large industrial and manufacturing enterprises—has the potential to lead to chaos of a number of kinds. For example, increasing the certainty that *some* supplier can always be found across the Internet may reduce the likelihood that the supplier found will be one who with whom there is an established relationship of trust and familiarity. Similarly, the buyer's ability to negotiate for the lowest price among many suppliers is matched by the supplier's ability to walk away from his traditional buyers in favor of those who offer terms and conditions that are in some way more attractive.

The lowering of barriers to inter-company transactions that enables technologically-mediated supply chains also removes some of the stays that gave stability to a company's supply processes. A well-constructed supply Boundaryless Information Flow Supply Chain implementation will not only connect suppliers with the companies that need their products, but also provide structure and stability to the markets and relationships that are conducted within it.

The sort of market or business structure that is to be provided to (or imposed upon) the participants will strongly influence the technical architecture and implementation models chosen to create a boundaryless supply chain. The example here is intended for use by a particular company (represented in the center of the figure) to allow it to achieve the benefits of “classic” vertical integration. These benefits are described by Chris Malburg of IndustryWeek.com as follows:

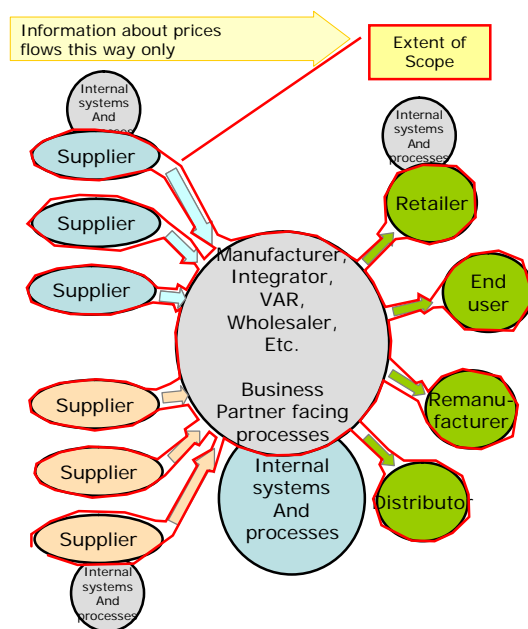
Companies can raise their overall value as they increase ownership of processes related to their product. Usually this is considered when critical suppliers are late or raise prices. Vertical integration lessens the risk of cost increases, disruption of critical material supplies, and

Six Example Boundaryless Business Models

quality problems. It has to do with the control we exert over successive stages of the entire production process. As risk falls, corporate value increases.

In the illustration we show the company at the center of the supply chain seeking to accomplish the benefits of both backward integration (bringing its suppliers of raw materials into the fold) and forward integration (seeking to establish tighter linkage with the outlets for its products) using a Boundaryless Information Flow environment or infrastructure that includes suppliers and outlets.

Figure 5:
A supply chain centered on its sponsor



Scope

The scope of this boundaryless business environment is centered on the organization that is sponsoring or implementing it, and includes:

- Between a company and its suppliers and customers
- But not necessarily among suppliers or among customers
- All those involved in process scheduling, inventory management, pricing, purchasing, etc.
- Information about products, prices, availability, etc. (available to buyers boundaryless)
- Some information about suppliers, customers, orders, shipping dates, accounts status, etc. (with restrictions)

Six Example Boundaryless Business Models

Objectives

The objectives of this form of boundaryless business include:

- Reduce (or further reduce) transaction costs between suppliers and the business
- Provide greater transparency, allowing partners to the transaction to observe and verify one another's actions
- Simplify “outsourcing” of supply functions:
 - Achieving benefits of vertical integration without sacrifice of competition among suppliers
- Support buyers’ “just in time” and similar inventory and supply policies:
 - Allow buyers more input into production scheduling
 - Improve information for production planning, reducing risk of over or underproduction
- Reduce cost to manage retailers' accounts by increasing “self-service”

Constraints

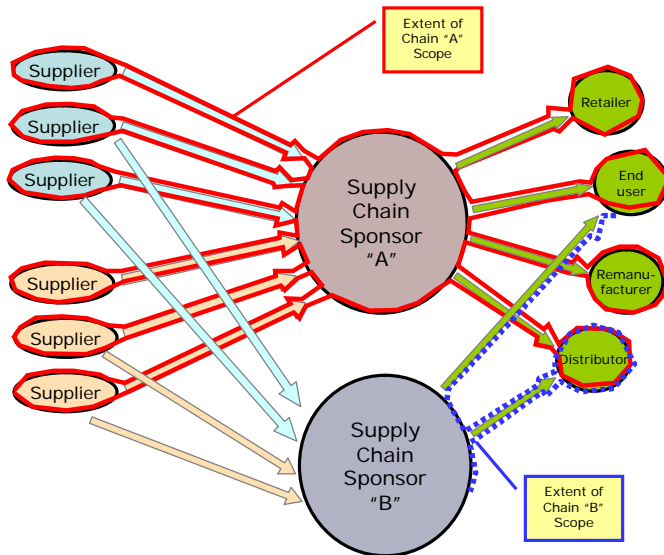
Some of the constraints or limitations on the implementation of this form of Boundaryless Information Flow environment:

- Suppliers should not be able to use the lack of boundaries to collude or price-fix.
- Internal processes – including trade secrets and intellectual property – must be protected.
- The choices of participants and terms of participation must not be in restraint of trade.

Open standards and open environments have greater force once boundaries begin to fall

Six Example Boundaryless Business Models

Figure 6:
Overlaid supply chains



Additional Considerations

The scope of the Boundaryless Supply Chain and the nature of the perimeter around it can have a strong influence on the competitive posture of the company implementing the Boundaryless Supply Chain implementation. In this description we have considered the case where a single company implements a supply chain to further its own corporate objectives. This is, in fact, a common model and one that is (relatively) easy to analyze, both for its business objectives and for its IT requirements. Companies that move first to create such effective infrastructures to manage their processes and “capture” suppliers and clients can achieve substantial advantages over their competitors.

Such models, in practice, can create significant problems for the “market”, and, sometimes, problems for its implementer or sponsor.

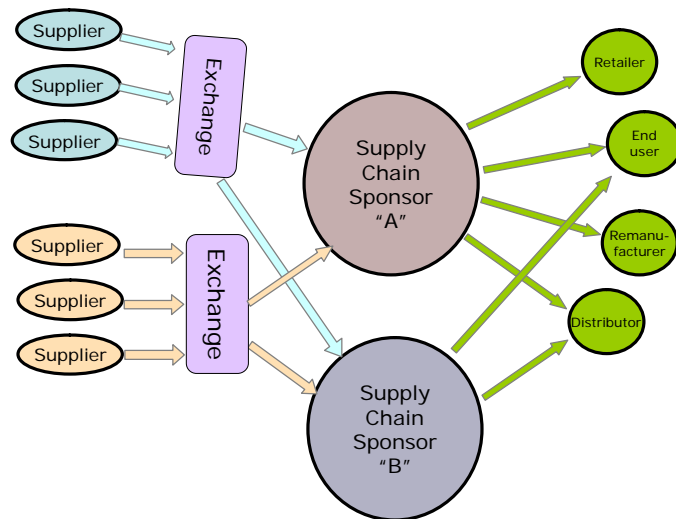
The most obvious problem with such a model is that the suppliers in this model often participate in more than one supply chain. Often each of those supply chains, controlled by a different sponsoring company, will be operated by different rules. This is appropriate as a manifestation of different sponsors' different business practices with respect to their suppliers. (The same analysis will apply to the forward integration of distribution and sales channels.) In some cases—especially when one (or more) sponsor introduces an IT-enabled supply chain management system well ahead of the general adoption of automated supply chains—different supply chains may be implemented with different technologies. In such cases, the burdens on the non-controlling participants can be substantial. To the

Six Example Boundaryless Business Models

extent one company can dominate an industry with its supply chain technology, it may be acting in restraint of trade and could face regulatory sanctions.

The figure below illustrates two supply chains, each with a different sponsor, overlaid on each other. Many of the suppliers and sales channels fall in both. From their perspective, it would be beneficial if both supply chains used the same (or at least, interoperable and non-conflicting) technology and standards. If that were the case, each of the non-sponsoring participants in the supply chains would be in a position to create its own scope of boundarylessness. This scope would be centered on the small participant in multiple supply chains, and would include, with himself, all the supply chain sponsors with which he does business. It might, actually be his own “supply chain” scope, including his own suppliers in a seamless work management environment.

Figure 7:
Supply chains evolve to markets or exchanges



In this way, boundarylessness tends to create more boundarylessness. Constructed forms of boundarylessness or interoperability – that is, systems imposed (benignly or otherwise) by one player – tend to elicit a standards-oriented response that creates an implicit model of boundarylessness that tends to defeat the constraining consequences of imposed forms of boundarylessness.

Boundaries to risk transfer need not impede business

The “push” from limited forms of boundarylessness to broader ones isn’t limited to the technology domain. In the case of supply chains, for instance, as more and more supply chains are built in an industry, they begin to bring more chaos to the system than they eliminate. Parallel supply chains operated by competitors overlap and challenge the non-sponsoring companies; implicit chains formed by the non-sponsors link the supposedly separate chains at their “ends” in ways that tend to defeat their original objectives. Often, this sort of

Six Example Boundaryless Business Models

emerging, technology-induced chaos forces an industry into a more stable configuration, realigning boundaries significantly. One way this commonly happens is through the introduction of technologically-enabled “exchanges” or “markets”.

The introduction of markets or exchanges changes the scope of boundarylessness in the supply chain. Markets serve to intermediate the relations between buyers and sellers, serving to buffer each from the other, bounding the risks involved in trading and settlement. This creates a new sort of boundary between the company at the center of the supply chain and its suppliers, one that allows efficient transfer of goods and services, but impedes the transfer of unmitigated risk.

Key Common System Architectures

- Workflow management
- Directory and service discovery
- System management
- Transaction management
- Collaborative work

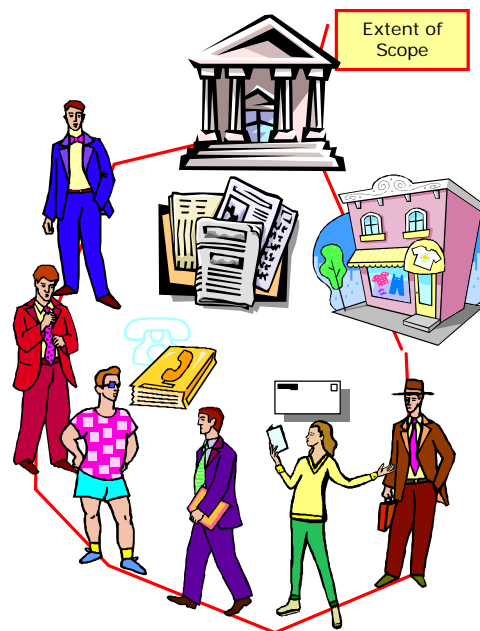
Six Example Boundaryless Business Models

Interpersonal Interactions

One of the most dramatic effects of the Internet is that it has made the use of IT—computers—commonplace. Technologies that, only a few years ago, were exclusively used by businesses and required specialized knowledge to operate are now used for personal purposes by all sorts of ordinary folk, for a host of everyday purposes.

How can we talk to anyone, anywhere, in the same language?

Figure 8:
The Boundaryless
Information Commons



One important aspect of this transformation is that computers are less likely used to “compute” than they are to communicate. In home applications computers are more likely to replace the telephone than the calculator. (Or more likely to replace the phonograph—another form of communication.) E-mail, instant messaging, and peer-to-peer sharing of “stuff” have made the Internet and its attached computers into the “commons” of the global village.

While the Internet has gone a long way to erasing boundaries that used to impede person-to-person communication, there is still more to be done. The boundarylessness of the person-to-person space was brought about with intent, but without design. There are forces or interests seeking to re-impose boundaries or limitations on the interactions between people over the Internet. New uses of the Internet or the introduction of new technologies may have unintended consequences that could tend to re-impose or reinforce boundaries or limitation. And, of course, there are still ways in which the Internet could be made easier to use to achieve a boundaryless flow of information from anybody to anybody.

Six Example Boundaryless Business Models

Scope

The scope of this universe of boundarylessness encompasses:

- Anybody, anywhere:
 - Acting as an individual
 - The sides of organizations that interact with individuals as individuals
- Personal communication:
 - Informal: E-mail, chat, gaming, etc.
 - Formal: applications, filings, notices
- Public directories:
 - To find communicants
 - To help establish authenticity of communication
 - To provide other information the subject might choose to share
- Public information:
 - News, information, public affairs
 - Entertainment, literature
 - Public libraries
- Government services

Objectives

The objectives for the interpersonal interaction form of Boundaryless Information Flow will be as varied as the individuals who might participate. Among those that will be more or less universally agreed are: Anyone can find and communicate with anyone else, with minimum intermediation.

- We must support the widest possible range of communication models; for example:
 - Immediate (synchronous; IM)
 - Deferred (asynchronous, e-mail)
 - Interactive (gaming)
- Participants have the option of:
 - Making themselves known or not (degree of anonymity)
 - Declining to interact with those who are not fully identified

Six Example Boundaryless Business Models

- Communications can be one-to-one or many-to-many.
- The environment must provide support for the dynamic creation and dissolution of groups or communities.

Constraints

Among the constraints under which this sort of boundaryless environment may exist are:

- It must allow participants to enjoy the protection of their country's laws and social norms.
- It must allow an adequate and appropriate level of authentication of “counterparties”
- It must support participants’ reasonable expectations of privacy:
 - Non-disclosure of personally-identifiable information
 - Non-intrusion into “private space”
 - No spyware
 - No SPAM

Additional Considerations

While this model of boundarylessness is not strictly a business model, it has significant impact on business. So-called B2C business models are to a great degree dependent on the consumers' ability to function as well independent individuals so that they can freely choose to do business with one or another business. The freedom individuals seek from commercial interests must be provided in such a way that businesses can still rely on contracts and other conventional commercial arrangements with their customers.

On the other hand, the creation and operation of the boundaryless infrastructure that makes Interpersonal Interactions possible must itself be provided by organized entities. These could be governments or collectives of individuals. In practice, though, the providers of the communications infrastructures that link individuals together are themselves commercial ventures. As such, the model of (non-commercial) interpersonal boundarylessness is itself a model in which entrepreneurs may find business opportunities.

Key Common System Architectures

- Messaging
- Security

Six Example Boundaryless Business Models

- Directory
- Information Architecture
- User Interface and Ontology

Contributing Common System Architectures

Architectural approaches solving problems of the sort described here begin with the identification of the elements that are or could be most useful and important in shaping the solution. In the TOGAF model, these are most often Common System Architectures.

In the following sections we discuss the Common System Architectures that we believe play particularly significant roles in realizing the business objectives of the notional business models above.

*What are Common System Architectures?
How do you know them when you see them?*

Workflow Management Architecture

Workflow management architectures describe the tools, services, and techniques that support the automation of a business process. Process definition, workflow interoperability services, application communication services, user interface services, and services that provide system monitoring are typically included in workflow management. Workflow systems are typically based on an asynchronous messaging model. (See "Messaging Architectures".)

Most of the boundaryless business models described here would benefit from inclusion of one or more workflow implementations, as does most non-trivial automation of business processes. However, business processes within the scope of the boundaryless environment are not usually defining of or tied to the particular model of boundarylessness. In some of these models, though, there are important requirements to link business processes outside the scope of boundarylessness to the processes implemented within the scope of boundarylessness. These include:

- Strategic Decision Support, to flow transactional and other production information to the strategic decision-makers
- Retail Sales, to link order processing in the boundaryless scope to order fulfillment, which may be outside the scope of the boundaryless environment
- Online Publishing, to move information into and out of the enclosed domain of the editorial process

There is one case where workflow architecture may contribute to the definition of a Boundaryless Information Flow business model described here:

- In Supply Chain Automation, collaborative planning or design, and the integrated scheduling of transfers of materials and other work among the participants may be implemented as a workflow architecture.

Six Example Boundaryless Business Models

Messaging Architectures

Messaging architectures include e-mail architectures (e.g., the open Internet architecture implied in such standards as SMTP, RFC 822, IMAP, POP, etc.; and proprietary architectures such as Microsoft Exchange and Lotus Notes), message bus, queuing and “pub sub” architectures (e.g., TIBCO, MQ series), low-level message interface architectures (e.g., JAXM, Symbian Messaging Architecture), and “instant” messaging and event notification architectures.

We expect that appropriately chosen messaging architectures will play defining roles in creating boundaryless IT architectures for the following models:

- Strategic Decision Support (e-mail and instant messaging in particular)
- Electronic publishing, outflow side (publish and subscribe architectures, in particular)
- Interpersonal Interaction (e-mail, instant messaging, and event notification architectures in particular)

Security Architecture

Security architectures are essential to any architecture or solution that considers creating or removing boundaries. Among the models described here, we believe specifically targeted security architectures will be particularly significant in the following models of boundarylessness:

- Electronic publishing (digital rights management)
- Interpersonal Interaction (signed, encrypted messages)

Directory Architecture

Directories of various sorts help to eliminate boundaries or make it possible to work within greatly extended boundaries by making it possible to locate things. There are many sorts of directory architectures, and, for each sort, there may be many specific implementations or instances. Some of the sorts of directory architecture that may contribute to Boundaryless Information Flow architectures are: directories of individuals, service directories, discovery services, and so on.

Among the models described here, we expect that directories will play defining roles in:

- Supply Chain (service discovery; person locators, signature or key management)

Six Example Boundaryless Business Models

- Interpersonal Interaction (global directories; e.g., SuperPages)

System Management Architecture

System management can be viewed through the eyes of the Operations, Administration, and Management (OA&M) personnel. The personnel of the OA&M organization are primarily concerned with making sure that the system performs as expected and is predictable in terms of behavior, response time, and availability.

Many of the services defined by a system management architecture take on special significance when the scope of a boundaryless business extends beyond the management domain of any one business. Services typically addressed by system management architectures include (among others): user management; configuration management, performance management; capacity, availability, and fault management (business continuity); accounting management; security management; network management; license management. Management services that are particularly significant for the construction of the boundaryless model described here include:

- Retail Sales: user management
- Supply Chain: user management, including user provisioning; and the various services that contribute to business continuity
- Electronic Publishing: accounting and licensing

Information Architecture

Information architecture addresses a wide range of subjects relating to the effective use of information. An information architecture may include or address: information storage and access; semantics and semantic management; information delivery services; and systems and methods for organizing, structuring, and relating various elements or bits of information. The manner in which an information architecture addresses information will depend, among other things, on the purpose for which the information is to be used. Examples of information architectures targeted for different usage styles are: relational databases, data warehouses, data mining architectures, and knowledge management architectures.

Information architecture is critical in all IT systems. Among the models of Boundaryless Information Flow described here, information architecture plays a defining role for the model in:

- Strategic Decision Support: knowledge management

Six Example Boundaryless Business Models

- Online Publishing
- Interpersonal Interaction: broadly useful semantic and ontological frameworks that allow individuals to communicate with a minimum of prior arrangement; search engines and similar information organizing mechanisms that allow individuals with modest IT resources of their own nonetheless to take effective advantage of the universe of IT services and information

User Interface and Ontology Architecture

User interface and ontology services provide the means to consistently present data to the end-user in the appropriate format. The interaction and ontology components provide services that assist in the formulation of requests for information, and enable visualization and presentation of the data accessed for easy interpretation and understanding within the context of its use:

- Strategic Decision Support is particularly dependent on a well-conceived framework to support the analysis of information in ways that facilitate “out-of-the-box” interpretation.
- Retail Sales
- Relationship-based Retail Services

Transaction Management Architecture

A transaction management architecture describes the services and techniques that support appropriately reliable transactions, possibly including multiple participating enterprises, individuals, and other, similar parties. Supporting such (business) transactions means that at the end of the transaction everyone engaged in the transaction is satisfied that their needs have been met. This usually requires assurance that each participant has fulfilled their portion of the transaction or that an appropriate form of recourse is available.

Effective transaction management also includes assurance that the transaction will be appropriately durable or persistent. It may also involve making the transaction transparent as it proceeds; that is, giving each participant the ability to “know” how the transaction is proceeding, and when and whether it is likely to be completed. This requirement for transparency is particularly important when creating a boundaryless environment including transaction participants who are outside the domain in which operational control over the transaction is maintained.

Transaction management architectures may play a significant role in

Six Example Boundaryless Business Models

defining Boundaryless Information Flow architectures for the following models of boundarylessness:

- Retail Sales
- Relationship-based Retail Services
- Supply Chain

Other Contributing Architectures

Collaborative Work Architectures

- Strategic Decision Support
- Supply Chain (for collaborative design and similar functions)
- Online Publishing (to support those parts of the editorial process that involve collaboration between author and editor)

Summary

In this document we have attempted to create a straightforward link between the notion of Boundaryless Information Flow and specific uses of boundarylessness to achieve businesses objectives. The six models of Boundaryless Information Flow we presented are ones that are commonly used, and can reasonably be accomplished—to some degree—using available technology. They are all things worth doing for some businesses, although few businesses need to do them all.

The Open Group, through its Boundaryless Information Flow Reference Architecture initiative, is seeking to make it easier to create and deploy IT that makes these models of boundarylessness possible. For each we will create a reference architecture that will serve as a guide. For technology vendors it will be a guide to the creation of products that work seamlessly together to achieve business objectives in a cost-effective way. For technology users, it will be a guide to the selection of products and services that best align with the company's specific business goals and model. For IT architects, integrators, and others who assist users in achieving their business objectives using IT, it will be a guide to the best practices and proven methods to use in creating custom solutions to these business needs, either singly or in combination.

In the coming months The Open Group and its members will gather information about technologies, standards, products, and processes that can be combined in recognized ways to achieve the six models. These will be compared and evaluated, and those that serve the needs of a model of boundarylessness well will be used to construct a reference architecture for that model. This process will identify the current opportunities to address these challenges; it will also identify the gaps that are yet to be filled.

Over time, the members of The Open Group, working together, will be able to eliminate the boundaries to effective implementation of Boundaryless Information Flow for business.

About the Author



Eliot M. Solomon has worked on the leading edge of Information Technology for more than 30 years. He gained experience in such diverse fields as electronic warfare, military C³, international telecommunications, medical electronics, and office automation equipment. Common to all this work was real-time operation, mission- or life-critical significance, distributed and networked computing, and a need for security, privacy, and assured integrity for the information being processed.

For the last 17 years Solomon has brought his expertise and creativity to the Securities Industry. In 15 years at the Securities Industry Automation Corporation (SIAC) and its subsidiary SECTOR, Solomon made significant contributions to the architectures of systems and networks on which the entire market relies. He was appointed SIAC's first Distinguished Technologist and Vice President, in recognition not only of his contributions to SIAC, but also to the entire industry.

Solomon is founder and chair of the Securities Industry Middleware Council, Inc. (SIMC), an industry organization that works to improve the infrastructure of the Securities Industry. Solomon has guided SIMC since its founding in 1996, and helped it become a significant influence on the software that vendors deliver to the industry, and the way the Securities Industry uses infrastructure technology. At The Open Group Solomon chaired the DCE Program and is now a member of the Security Forum Steering Committee. He is frequently invited to speak at major conferences on the subject of linking information security and business policy, and the management of risk and trust. He holds an A.B. from Columbia University, and an M.S. from Polytechnic University.

About The Open Group

The Open Group is a vendor-neutral and technology-neutral consortium, committed to a vision of **Boundaryless Information Flow** achieved through global interoperability in a secure, reliable, and timely manner.

The Open Group mission is to drive the creation of **Boundaryless Information Flow** by:

- Working with customers to capture, understand, and address current and emerging requirements, establish policies, and share best practices

Six Example Boundaryless Business Models

- Working with suppliers, consortia, and standards bodies to develop consensus and facilitate interoperability, to evolve and integrate specifications and open source technologies
- Offering a comprehensive set of services to enhance the operational efficiency of consortia
- Developing and operating the industry's premier certification service and encouraging procurement of certified products

The interoperability that characterizes **Boundaryless Information Flow** results in gaining operational efficiencies and competitive advantages. Through access to integrated information, across the extended enterprise and beyond, employees, trading partners, and customers are enabled and empowered.