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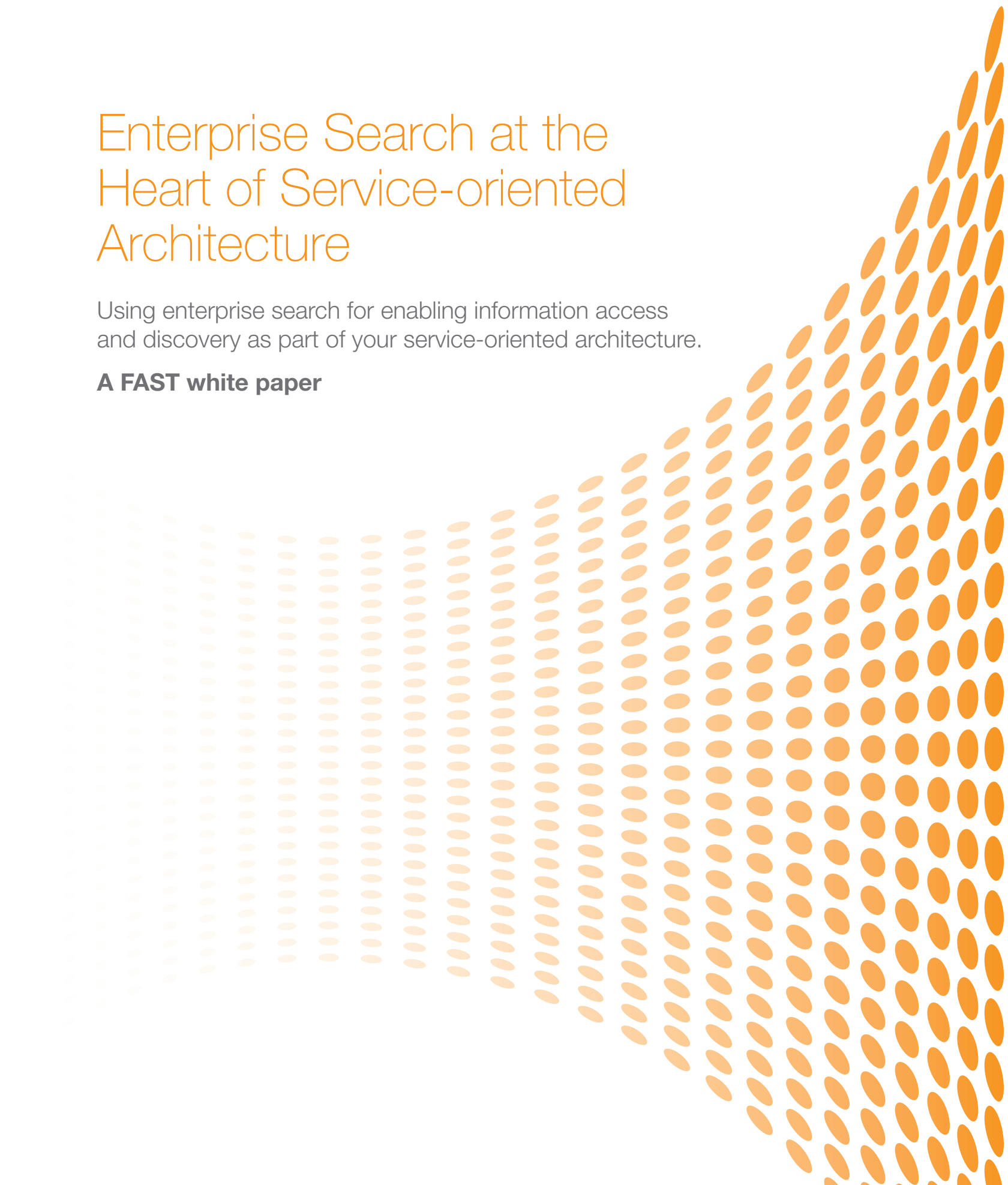
Enterprise Search at the Heart of Service-oriented Architecture

Using enterprise search for enabling information access and discovery as part of your service-oriented architecture.

A FAST white paper

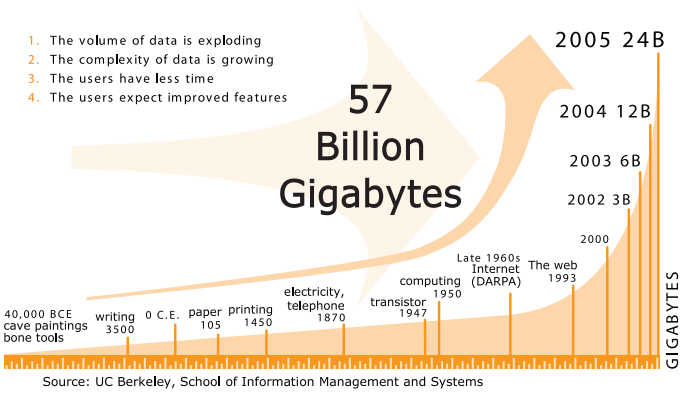


Data is Everywhere

A critical aspect to implementing a service-oriented architecture[1] is ensuring fast, easy, and secure access to high-quality data. The amount of data is growing extremely fast, and the main bulk of new data is unstructured. A recent report published by International Data Corporation (IDC) found that 161 exabytes (billions of gigabytes) of digital information was created last year.[2] Dale Vile, research director at analyst firm Freeform Dynamics, commented to ComputerWeekly: "The biggest problem is that many people are drowning in information that is made up of unstructured data."[3] Traditional systems simply do not handle unstructured information in an optimal way, and you typically end up in a situation where data resides in silos. As a result, it is difficult or impossible to use it in concert with data in other silos.

Consider the data on your customers and how difficult it can be to get a complete 360-degree view of those customers. This data can be found in the ERP system, CRM system, Oracle databases, and old mainframe-based legacy systems - just to name a few. Some highly relevant data that impacts business decisions is also often found in unstructured data repositories, such as e-mails and reports saved in various file formats.

Adding to this complexity is the fact that most back-end legacy systems were not meant to be remotable and exposed as part of a mission-critical service-oriented architecture (SOA), when they were built. As a result, integrating and service-enabling these systems often bring tough challenges.



Source: UC Berkeley, School of Information Management and Systems

93% of all data is born digital!

Service-oriented Architecture

Service-oriented architecture (SOA) can be seen as an architectural style for building software applications based on sharable and reusable distributed services. When implemented correctly, SOA helps businesses respond faster and more effectively to changing market conditions. Standards-based services can be combined, configured, and reused to meet the ever-changing dynamics of business.

Web services is often the technology used to implement an enterprise SOA. For more information on SOA, SOA principles, and references to literature, see Wikipedia.[1]

Approaching such challenges with custom programming, "hard-coded integration", and appropriate transformation of data formats often leads to inflexible architectures. Much of the promise and agility associated with SOA can be lost here. Data - and how it is abstracted and managed - is critical to the success of any SOA implementation.

The Data Access Layer

An emerging best practice is the use of a software layer between your heterogeneous data sources and the services that are exposed. This data access layer provides unified access to a number of back-end systems and simplifies application and service development and maintenance. It abstracts away systems with poorly designed data models and allows for changes in back-end systems without impacting service consumers. Another benefit with the data access layer is that data silos and point-to-point integrations are avoided.

The data access layer can also be helpful in providing a unified enterprise-wide data model. This can be, for example, a schema representing the canonical model of the customer, order, inventory, etc. Providing such an abstracted data model is preferable, as it enables abstractions that make logical sense to SOA.

By abstracting data from its source and delivering it as a service to its consumers, such as an application, a portal, BPEL (Business Process Execution Language) processes, or other composite services, the data access layer helps ensure that the SOA

implementation is flexible enough to respond to rapidly changing business needs.

Transforming Data into Information

When data is put within a context where it is useful and where it can facilitate learning, solve business problems, and create value, it becomes information. This illustrates the importance of the context – providing access to data is not enough.

Information = Data + Context

Contextual Insight®, one of the key capabilities in FAST ESP®, provides functionality to further enrich both structured and unstructured content by analyzing structural and semantic features. Entities, such as person names and locations, are automatically extracted and can be leveraged in combination with scope search to provide unprecedented precision in locating information.

The Search Advantage

Enterprise search has evolved to become an infrastructure necessity. The best practice among enterprises today is to implement search as a core platform, on which a number of solutions are built. An enterprise search platform, such as FAST ESP, includes a number of capabilities that make it a preferred foundation for accessing information through services:

- **Unprecedented scalability and performance**; FAST ESP is designed to handle a very large number of simultaneous users and provide precise, highly relevant answers with sub-second response times.
- **Ability to handle both structured and unstructured data**; data can be retrieved form a wide variety of data sources, refined and cleansed through a linguistics pipeline, and indexed for easy access.
- **Ability to put data in context**; FAST ESP provides a number of enabling technologies, such as linguistic processing, results clustering, entity extraction, and Contextual Insight, which can be leveraged in an SOA environment.
- **Extensibility**; the platform allows for customization and development of new domain-specific logic.
- **End-to-end security**; FAST ESP addresses security at all critical levels: content, server environment, and search application.

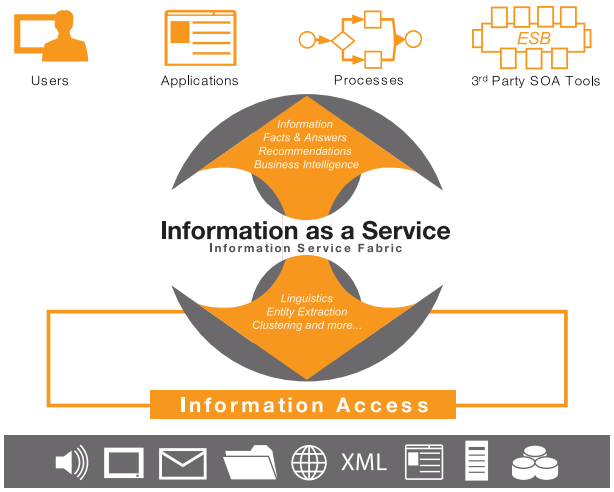
A good use case for the enterprise search platform is offloading back-end systems, such as databases and other legacy systems, which were not initially meant to be remoted and used in a high-performance SOA environment. The need for scalability and high-performance services is increasing with the explosive growth of data, emergence of Web 2.0 technologies, and new usage patterns.

When AutoTrader.com replaced their back-end database system with FAST ESP, they realized huge total cost of ownership (TCO) benefits: a nearly 50 % cost reduction, including hardware and software acquisition and operating costs. They replaced a 32-CPU system with a 20-CPU system, and 10 full-time equivalents (FTE) with one half FTE.

FAST ESP Enables the Service-driven Enterprise

FAST ESP is a strategic part of an SOA implementation. FAST ESP quickly embeds into existing and evolving infrastructures, and it enables the enterprise to be optimized around services and servicing its customers, employees, and partners. FAST ESP delivers information as a service, and allows the service-driven enterprise to rapidly respond to new requirements and changes in the market. It allows organizations to move away from data silos and toward a flexible SOA by offering fast, easy, and secure access to high-quality data. This is done in a standardized and uniform way.

Currently, about 20 FAST ESP services are offered out-of-the-box for administering the platform, as well as searching and processing content. These services can be used, for example, for tuning the order of search results (Boost-and-Block Service),



managing dictionaries (Dictionary Service), and performing and refining queries (Search Services). With the Information Service Fabric, which is the name of the new pluggable services framework that comes with FAST ESP 5.1, a number of new, domain-specific services can be implemented and deployed on FAST ESP.

The information service fabric

The Information Service Fabric is based on the best practices for developing standardized enterprise services, and it is built on an open, flexible architecture. It allows the enterprise and its service providers to extend the FAST ESP platform by developing and deploying new custom services. A number of capabilities, such as linguistics, results clustering, and entity extraction, can be leveraged as part of the new custom services, for example, for handling unstructured data or creating new domain-specific services.

FAST ESP supports industry standards for ease of integration. In particular, all services can be accessed as Web services (WSDL and SOAP-based). This allows for fast, flexible integration with existing and future services, applications, business processes, and third-party SOA products, such as BPEL (Business Process Execution Language) engines for service orchestration. Alternatively, the FAST ESP platform services can be accessed through a Java API, when a more tightly-coupled integration is a more desirable option.

Case Study: Address Service Based on Search

Address data is often crucial to the enterprise's core business. It is needed for the activation of services, billing, contact management, marketing, inventory management, etc. Since it is so fundamental and pervasive, this data is used in a large number and variety of applications.

One of the world's largest telecom operators needed to improve the quality of their address data and the related processes both in the front office and the back office. In the front office, the customer is often expected to input data as part of a self-service process. This can sometimes lead to challenges due to erroneous or incomplete data. For example, the data input can contain the wrong use of synonyms ("homestead" instead of "station"), use of alternative spellings ("Jeffrey" instead of "Geoffrey"), or splitting words wrongly ("Westlake" instead of "West Lake"). In the back office, the problem can be that of matching conflicting addresses. For example, the name of a specific street may change, as it continues through different parts of a city. Some customers may have provided a wrong street name but the correct locality - often the case with residential customers, who may have grown used to outdated street naming conventions - or they may have given a correct street with the wrong locality. The latter is a common case with business customers, who wish to appear to be located in the neighboring, more up market suburb.

This telecom operator's primary data quality issues were:

- Address correctness issues: misspelled or shortened names, missing information (for example, "170 Anne Street Washington" (no state or postcode)), and database-specific ambiguities.

- Address parsing ambiguities. For example, in "Five Level House, 170 Anne Street, Washington 3000" is the word "Level" specifying a level (for example, Level 5), the name of a property (five level house), or other cases where the missing information leads to multiple possible interpretations.

- Lack of separating commas to delineate depth. The database requires this to be specifically and correctly split out into appropriate levels before it can be matched (for example, Suite 501 L 5 shell house 170 north tc Washington).

To solve these problems, which were spread among a large number of applications, the telecom operator built a centralized Address Service. This service was built on an enterprise search platform. The platform features were extended with domain-specific logic to handle the telecom operator's specific business requirements. With the new Address Service, they were able to support both structured and unstructured input. As an example of structured input, their customers typically provide and confirm data through a form on their Web page. This input is then matched against address fields. An important business rule for them was to ensure a correct primary address first, so this was domain logic implemented on top of search.

For unstructured input (for example, a customer service representative typing an address when talking to a customer on the phone), a configurable transformation pipeline was incorporated into the service when looking up an address. If the user input does not return any results, the service will automatically "correct" the user input. It will do a number of re-queries until it finds the results. The query transformation pipeline is selected at query time, and domain and client type knowledge is used to do this. Some examples of transformations in the pipeline include spellchecking the locality, substituting the adjoining locality, phonetic matching, and discarding specific parameters.

A number of features and capabilities found in FAST ESP were leveraged to implement this Web service. Some examples include XML Scope Search for searching over complex data structures, navigators for the rapid refinement of "loose" searches, spell checking for corrections against domain-specific dictionaries (street and locality names generated nightly from the database), search profiles to facilitate separate query processing for different clients, and N-grams for generic input matching on unstructured input.

In summary, the FAST ESP platform provided matching features and a flexible architecture that allowed the telecom operator to implement an innovative new service. The Address Service has become a core service in their service-oriented architecture. It also supports their business by providing high-quality address data for a number of different applications across the organization.

Architecting for the Future

The line is blurring between the enterprise and the Web. Increasingly, organizations are starting to leverage global-scale services on the Internet, i.e., services outside the firewall. These can be, for example, services provided by SaaS (Software as a Service) providers, such as Salesforce.com. At the same time, Web 2.0 technologies, such as wikis, blogs, and mash-ups, are gaining more traction in the enterprise. With these new ad-hoc applications and enabling technologies come new usage patterns and new challenges. One of the most critical challenges will be to provide a flexible, scalable, and high-performance architecture supporting and enabling business agility.

FAST ESP enables the service-driven enterprise by implementing a flexible, secure, and unified set of services for information access. FAST ESP supports both structured and unstructured data, and it provides an open, flexible architecture. With the new Information Service Fabric, FAST customers and partners can develop and deploy new domain-specific services on a highly scalable, secure platform.

[1] See side note and Wikipedia's description of SOA http://en.wikipedia.org/wiki/Service-oriented_architecture

[2] IDC Report: The Expanding Digital Universe: Worldwide Information Growth Through 2010

[3] ComputerWeekly Coverage of IDC Report http://www.computerweekly.com/Articles/2007/03/13/222312/archive-tools-essential-as-data-growth-rises-says-idc.htm

About FAST

FAST is the leading developer of enterprise search technologies and solutions that are behind the scenes at the world's best known companies with the most demanding search problems. FAST's solutions are installed in more than 3500 locations.

FAST is headquartered in Oslo, Norway and Needham, Massachusetts and is publicly traded under the ticker symbol 'FAST' on the Oslo Stock Exchange. The FAST Group operates globally with presence in Europe, North America, the Asia/Pacific region, South America, the Middle East and Africa. For further information about FAST, please visit www.fastsearch.com.

For any feedback or questions related to this paper, please contact us at **feedback@fastsearch.com**.

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