George Toms, Ph.D.

EXECUTIVE SUMMARY

Big data is a well known problem and it is currently being stored on clouds and processed on super computers with burdensome resources (RAM memory, storage space, and processing power).

We invented and fully implemented new Web technology that allows us to harvest knowledge from big data on a regular laptop, tablet, or phone inside a Browser based on the user's needs – not the application's limitations. This technology has no analogs that currently exist in the world today.

To achieve this power of web applications, we found a way to process millions of records extremely fast and without any server support. As a result, our technology accelerates the Web application, reduces network bandwidth requirements, and distributes the server load to thousands or millions of users' computers.

Our technology is based on current, standard web technologies: JavaScript, HTML, and CSS. No new hardware, programming languages, plugins, nor are any other resources required.

CONTENTS

Introduction: Big Data Processing in Real Time

Imagine having portable, zero-footprint one page business applications with web simplicity, desktop performance, and secure off-line data processing based on the user's needs – not the application's limitations. Now you can with **Toms JS**, a new information-mining engine from **Megadata Web** that is revolutionizing the way companies use business applications on the web.

Megadata Web is a web technology that literally delivers "quantum leap" improvements in how Web browser users can rapidly and efficiently harvest the knowledge from their data.

Designed for simplicity and ease of use, Megadata Web dramatically streamlines and optimizes the entire process of information mining, editing, analyzing, and reporting on data and information not only from any web, intranet, or extranet accessible database but also from your computer hard drive (local storage).

It not only accelerates Big data pagination 1,000+ times faster,
but it also gives users the ability to data mine using any data parameter,
and it is revolutionizing the way Web users can do information mining from big data when it comes to speed and efficiency.
Megadata Web is a powerful engine that allows users to harvest knowledge from big data based on their needs – not the application's limitations.

Most business applications process big data on servers. We can shift this to the client (web browser) instead of delegating it to an overloaded server. Thousands to millions of user computers can simultaneously simplify and accelerate the whole application and therefore not rely on the number of server processors available to users.

Current Product Demonstrations

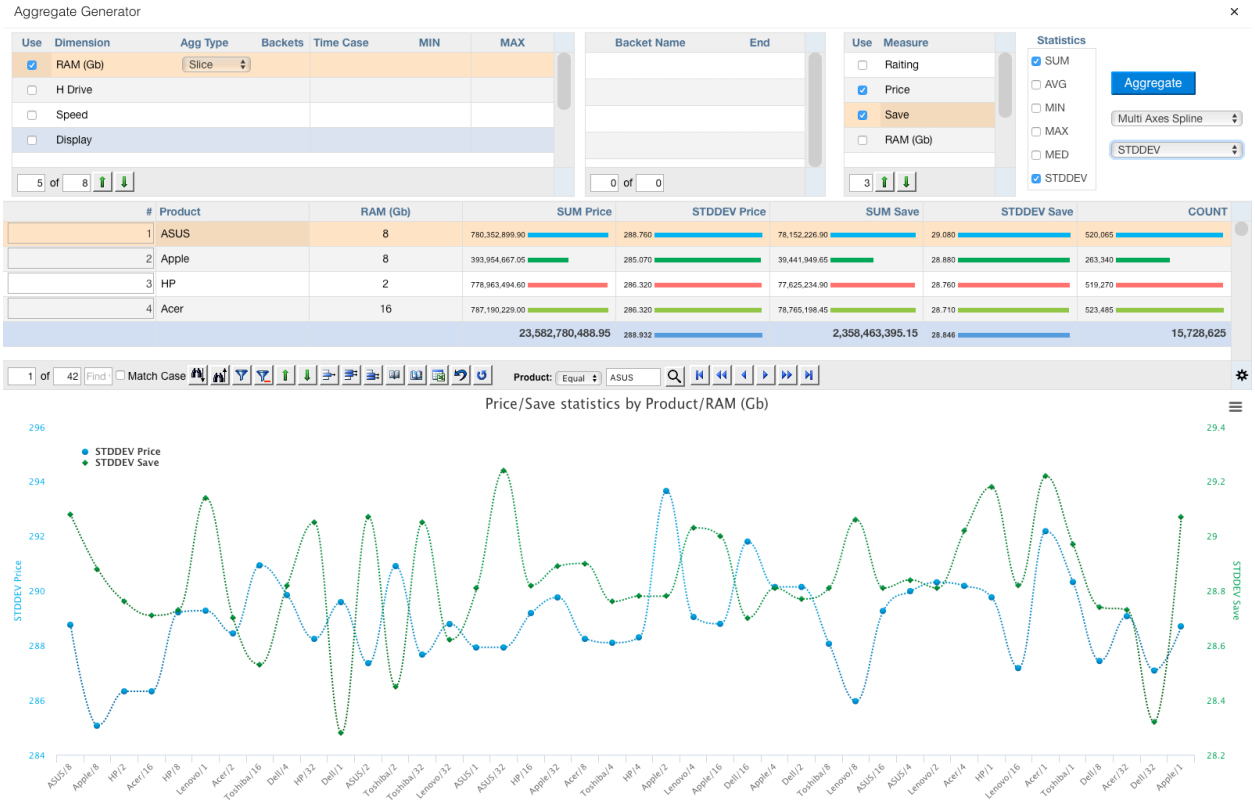
Based on our technology platform, we have created products that process big and super big local data within web browsers on a user's machine.
Here are some of them:

- Data management and knowledge harvesting system **Alisa** for visualization, mining, editing, aggregation, analyzing, and reporting of big (up to **15,000,000** records) data tables. Compare this to Microsoft Excel which processes a maximum of only **1,048,576** records in one table.
- VCF File Viewer **Alyona**. It can be used for processing of super big (up to **100 GB**) VCF files in multiple chunks with up to 1,000,000 records per chunk that browser users can load from a local hard drive and it's a secure process on the computer off-line.

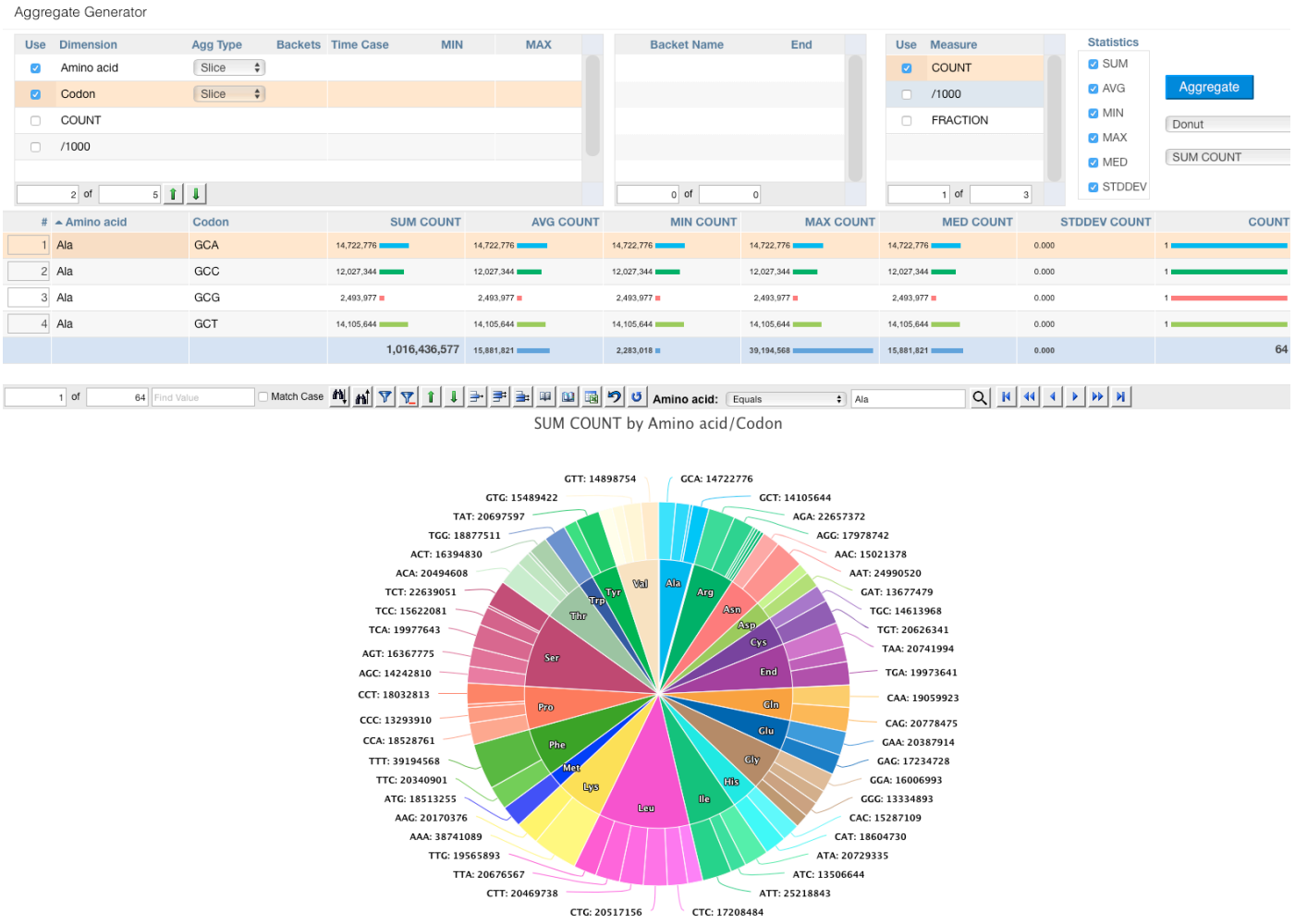
- Motif Finder **Anjela** for searching motifs in nucleotide sequences (FASTA format files).
- Codon Usage Calculator **Margo** for calculation usage of amino acids and codon in nucleotide sequences (FASTA format files).
- Data management and knowledge harvesting system **Anastasia** for processing of super big (up to **200,000,000** records) data tables.

Selected Examples:

Alisa



Margo



Step-by-Step Product Guide

The following example illustrates how **Toms JS** enables fast and efficient off-line data processing:

Step 1: Data/information is requested. The process starts when a knowledge user, using a web browser, requests data from any Internet-, intranet- or extranet-accessible database in standard HTML (or AJAX) format or from a local hard drive.

Step 2: Request is processed. The web server passes the data request to the proper application server and database server(s) to retrieve the requested data records. With Toms JS, sorting, preprocessing, or formatting functions are not required in the SQL request.
The database engine locates and retrieves all requested data and delivers it back to the

application server/appliance. With Toms JS, data records are now delivered unsorted and unformatted.

Step 3: Data delivery. The raw data, along with the Toms JS Toolset, is passed to the web server and delivered to the client. The data is then automatically placed into the local RAM database. After receiving the data, remote users can disconnect from the Internet and easily process the data off-line locally.

Step 4: Client-side data search, analysis, reporting, and knowledge harvesting. Now the real power and freedom begins, without any more overloading on the server-side application or database. Using Toms JS tools, the user can add an unlimited amount of new records, modify, filter, sort, and index the data off-line, use Toms JS's search engine for data mining and aggregation, analyze data with advanced data analysis tools, and generate ad-hoc reports, graphs, and charts.

Step 5: Database updating process (if needed). The client can append, edit, or delete data from their local RAM database as needed. The affected data elements are then automatically validated (per preprogrammed rules) and transferred back to the database server for fast batch processing.

Technological Superiority: Speed and Data Volume

- New knowledge harvesting tools for laptops, tablets and phones.
- Web browser simplicity and real interactivity using standard solutions.
- Dramatic increase, by up to 10,000 times, the amount of data/information that can be delivered in just a single web page. Users will never again see the ubiquitous, unproductive query response: "first 20 of 432 records" in their web browsers.
- Reduces, by up to 98 percent the redundant and unnecessary network traffic associated with current database querying methods. This translates to increased network capacity for future expansion, and lower maintenance and MSP expenses.
- Eliminates the unproductive and tedious process of repeatedly "cutting and pasting" information into Microsoft Access or Excel in order for data analysis and reporting to occur. With Toms JS, users perform local data filtering and "what-if" analysis on all available data without ever leaving their web browser.
- Greatly reduces the probability of costly database security breaches by simply reducing the number of server sessions required to retrieve all information from the database.
- Minimizes costly Internet bandwidth requirements due to reduced network traffic.
- Distributed computing - former server-side SQL tasks, like data sorting, indexing, and reporting, are now accomplished more efficiently on the end-user's browser-equipped PC, Mac, or Unix workstations without the expense of pre-installing or managing software on the client's desktop, laptop, tablet, or phone.

- Supports stateless (session-less) web application design that reduces the consumption of server resources and increases scalability.
- Remote users (sales executives, field service personnel, application engineers, students, etc.) can now download all information via the web, and then disconnect to process the data off-line to work in areas without Internet access.
- Allows qualified users to add or modify multiple database records using our local web-database tools. In addition, all updates can be "pre-validated" (using predefined data-formatting rules) before being sent back to the main corporate database, ensuring database standards, integrity, and quality.
- Supports code separation between the server and the client: to keep the code cleaner and more manageable; to simplify adding and removing features; and for easier debugging and testing.
- This client-side technology is based on ingeniously implementing JavaScript, CSS, and HTML/DHTML. We are compatible with web applications, networks, computer systems, and web browsers. That means no wasted investments and a quick learning curve for both developers and users.
- The technology is 100 percent UNICODE-UTF 8 compatible, thereby facilitating the globalization and localization of database-intensive web applications.

Megadata Web vs the Competition

All our competitors are using only two visualization solutions: “Infinite Scrolling” and “Good Old Pagination”, so called, web 1.0 solution!

Currently, many popular program libraries and frameworks were created for simplifying and accelerating the development process of applications. These libraries were not geared towards processing big data efficiently. This is why most web applications become slow, complicated, and require permanent server support.

Now every web user has a powerful, multi-processor computer but big data web business applications do not use these free and endless resources because popular web technologies have four major restrictions:

- Slow delivery of large amounts of data
- Browser performance limitations
- User computer memory restrictions
- The inability to process data inside the browser off-line

We found a way to resolve all these problems by developing the following improvements:

- For faster data delivery, we deliver raw data. Plus the recent product “Google Fiber” modem now allows the delivery of millions of records per second.
- Quantum leap performance of data processing because we can sort 1 million records in one second.
- Developed an advanced compact data format to avoid memory restrictions.
- Getting all data required for endless data processing off-line.
- An advanced data processing engine was created with an emphasis on simplicity, usability, performance, and maximum functionality without the problems inherent with other solutions.

We invented and fully implemented new Web technology that allows Web users to harvest knowledge from big data onto a laptop, tablet, or phone inside a Browser, based on the user’s needs – not the application’s limitations.

Why Is This Important?
According to the analyst firm Gartner, distributed off-line client processing is the future of the Internet.

By transferring the data processing overhead from the server to the client, the user’s ability to view and freely process information is significantly enhanced while simultaneously increasing Internet access and server throughput.

Built-in Product Features

Using the latest version of technology, we implemented many one-page web products, which can demonstrate the unlimited benefits and intuitive simplicity of this new approach. These products demonstrate the following Megadata Web built-in standard popular features:

- Adding, editing, deleting
- Sorting, searching, replacing
- Filtering, excluding, temporary hiding, advanced filtering
- Navigation, reordering, scrolling
- Standard reporting, grouped reporting
- Aggregation, pie charting
- Off-line changes and data saving, editing, and deleting
- Data exporting
- Undo and start over
- Data website visiting
- Sending an email and email batches
- Data address mapping
- Right-click menu data controls

- Data to be viewed (processed) customization: resizing, moving, make visible, and make invisible
- Controls customization: moving, make visible, and make invisible
- Inline data editing
- Data validation with diagnostic: Show recommendations for correcting errors.
- Data suggestion for invalid data entered
- Data entry helper: calendar day picker

All these features are executed off-line – no server support required.
All information is visible (located above the fold) – no pagination, no page scrolling, no invisible data, and no invisible controls.

Is it easy to implement?

- Compatible and interoperable with all standard browsers (Safari, Chrome, Firefox, Edge, Opera)
- Integrates seamlessly with third party server databases, middleware platforms, Operating Systems and technologies (e.g., .NET, PHP, Java, Node.js…).
- Requires no additional client-side software or plug-ins

Conclusion

The Client (Knowledge Users)

Toms JS technology brings powerful desktop performance and off-line processing abilities to the web application. As a result, knowledge user productivity is dramatically improved because multiple web downloads are no longer required to retrieve all queried data. Toms JS's web database tools run directly into the client's computer (in RAM), so that data searching, filtering, indexing, and analysis are nearly instantaneous. No longer must users waste time waiting for server access or slow Internet connections. With Toms JS, users can efficiently execute their own ad-hoc queries and reports right from their own computers without having to understand SQL, Crystal, Brio, Cognos or other complex applications. Plus, Toms JS does not require costly and difficult-to-use advanced search engines. This eliminates the need for overworked IT staff to write custom queries and reports that often require several adjustments in order for them to perform properly. User queries can be run against either the "local" web database or the entire server-side ("global") database for a more complete analysis. Once data is received on the client computer, Toms JS's self-contained web database no longer requires a connection to the Internet. It simply stores the data into RAM, which performs much faster than the hard drive. They can then validate and format the data on their computers before re-submitting any updates to the corporate database. Any errors and omissions are corrected immediately, thereby saving time for the user and improving data integrity. When the user logs out, the data is automatically deleted from RAM memory, which eliminates worries about lost, stolen, or broken devices. Users do not need to buy or install any applications on the device, as the only client-side software required is a standard web browser. Additionally, users do not need to install any

browser plug-ins or additional software on their computer.

Target Clients

- All major corporations for business analytics and big data processing needs
- All major high-tech companies (Google, Microsoft, Apple, etc.)
- Banks
- Credit card companies
- Big Internet stores
- Biotech industry for DNA/RNA processing (alignment, motifs searching, codon usage calculation, etc.).
- Corporate IT/MIS/DBA support groups, web application developers (in-house and OEM), and knowledge workers - analysts, engineers, scientists, planners, managers, salespeople, researchers, teachers, students, etc. – for whom the ability to access data quickly, directly relates to their productivity for marketing optimization, portfolio and risk analysis, software analytics, operational intelligence, fraud prevention, etc.

Megadata Web is a powerful addition for all web-based big data processing and analytics platforms as well as for all types of organizations, from startups to Fortune 500 companies.

Megadata Web's innovations also have applications for professionals in many fields including university researchers, election officials, bookkeepers, auto manufacturers, medical researchers, and aerospace engineers.

Corporate IT/MIS/DBA Support Groups

For IT and MIS departments, Toms JS delivers efficiency, effectiveness and substantial cost savings. Toms JS facilitates up to a 98 percent reduction in unnecessary network traffic to database servers and significantly reduces the number of web database servers required, which makes it possible to reduce the number of expensive processors per server. Fewer server hardware requirements translate into lower capital and ASP/MSP outsourcing costs, as well as having the increased server capacity reduces capital expenditures as new web applications are introduced and the business grows.

Toms JS reduces maintenance costs (both personnel and supplies) related to server upkeep, and less web traffic to database servers ultimately reduces costly bandwidth requirements. With fewer and shorter server sessions initiated to retrieve the requested data, Toms JS greatly reduces the probability of unauthorized database access by intruders and hackers, thereby enhancing security without any additional expense. Since Toms JS is compatible with all major databases, server hardware and software platforms, no additional infrastructure investment is required.

From a user standpoint, Toms JS is fully compatible with all end-user computers and operating systems. There's no software to deploy or maintain on client computers, and

users will automatically receive the latest version of the Toms JS Toolset with each data download or information request.

If desired, clients can be allowed to efficiently and safely update the retrieved information on their own computers. This time-saving feature further reduces server workload while improving database integrity and quality.

Web Application Developers (Both In-house and OEM Developers)
Separation of client-side software from server-side software greatly simplifies the complexity of web applications. Server-side developers no longer have to know JavaScript, HTML and CSS, and client-side professionals no longer have to use server software to generate web pages. This separation opens the same benefits for the web application as the separation of the database from the application business layer - simplifies and accelerates application development and debugging.

Separation of client and server software development also optimizes, simplifies, and accelerates the development of complex enterprise web applications. Now, the entire development process can be completed in two simple steps:

1. Fast client-side web page creation, with maximum attention to off-line client- side engine, data processing, and performance. Data for debugging are included inside the web pages. Simultaneously, server-side developers along with client-side professionals finalize the system architecture, requirements to server-side functionality, and database structure and protocols for exchanging data between the server and client. The result of this step is a demo for the web system with full client-side functionality and logic.

2. Simultaneous implementation of database creation and optimization, server- side application development, client-side “look and feel” adjustment, documentation writing, advertisement, and presentations, as well as marketing and sales and user training.

Because Toms JS uses standardized JavaScript objects and its own adaptable HTML templates and widgets, web applications can be developed much faster. Database SQL requests are greatly simplified, with sorting and indexing removed from the database server and performed much more efficiently on the client's computer. Processing data on the client-side instead of the server-side allows the developer to concentrate on the main application functionality instead of focusing on details like data mining, sorting, reporting, indexing or data validation, which are now handled on the client's computer.

Toms JS maintains full UNICODE UTF-8 compliance so that developers don’t have to worry about their ability to globalize and localize data and web site information. The technology also eliminates the need for expensive server hardware expansion, thus reducing the total cost of ownership of application software. Reduced project complexity and costs generally lead to shorter sales-cycles, increased sales volume, higher margins, and happier customers.

Company Background

Megadata Web is a company that focuses on big data management, analysis and knowledge harvesting. The company has its own technology platform, developed over the last 17 years, and is backed by several intellectual property copyrights.
This technology was created to process big and super big data for web applications up to a thousand times faster than any other competitor on the market today.
In some cases, we don't have any competitors at all because other current web technologies cannot begin to handle processing that much data.
Forty to fifty years ago, big computers were slow. They handled 20,000 operations per second. Now our computers can process 2 - 3 billion commands per second. Every computer now has 4 - 16 processors, so each in parallel can do the same.

Megadata Web helps distribute server load to thousands of user computers, tablets, and phones. You download data quickly off the server, process it off-line, and then reconnect to the Internet if you need to transmit information back.

Megadata Web is fully implemented, debugged, and being installed on a variety of Internet client/server applications.

Some companies that use Megadata Web technology include:

- Guardian Analytics, Inc. (online banking fraud prevention)
- Novartis Institute Functional Genomics (science for preclinical drug discovery)
- VMWare, Inc. /Cetas Software, Inc. (big data analytics)
- Secure Campus, Inc. (network security)

Team

George M. Toms, Ph.D.
President and Chief Technology Officer

Dr. Toms holds advanced mathematical knowledge in Algorithm Theory, Artificial Intelligence, Boolean Logic Theory, Discrete Math, Graph Theory, Logic Network Theory, Calculus, Mathematical Logic, and Parallel Data Processing.

He is an expert in distributed Web client (Browser) off-line data processing, Rich Internet Applications, software integration and internationalization, algorithm optimization, mathematical logic, parallel Boolean data (vectors and matrices) computing, data sorting and searching, text parsing and processing, custom database optimization, and application acceleration.

Dr. Toms earned his doctorate in mathematical cybernetics and his master's degree in applied mathematics from Tomsk State University in Russia.

During the 20 years he was an Associate Professor at Tomsk State University, he also worked as the lead of the laboratory in aerospace technology developing systems and software. He invented the fast and efficient algorithm for synthesis of easily testable and reliable digital devices.

Since 1996, Dr. Toms has concentrated his efforts in Web development. He has extensive experience in internet/intranet high-traffic business applications architecture, design, and development.

Some of his accomplishments include the following:

- Invented and developed Toms JS cross-browser Rich Internet Application technology, which allows the creation of a desktop performance business application inside of a Web Browser, and transfers the data processing overload from the server to thousands of client computers
- Architected and developed the Toms JS Scheduler – single-page business schedule application
- Increased the speed of Web applications by 5-30X the standard speed
- Can sort 1,000,000+ records inside a Browser (Chrome, Safari, Opera) in one second
- Implemented the fast timetable with 25,000,000+ cells for Guardian Analytics, Inc.
- Architected the One Page Web RIA for the company CardioNow, Inc.
- Reduced RAM usage of Web applications by a factor of 10
- Increased speed of database applications 25-100X the standard speed
- Published 20+ engineering and research articles

Nikolai N. Pepik
Chief Executive Officer

Mr. Pepik has experience in working with international businesses in both Russian and American markets and this has given him the ability to manage and lead successful international companies.

He holds a master's degree in civil and construction engineering from the Polytechnic University in Russia. He has held several management positions in successful enterprises and has been engaged in working with privately owned businesses.

In his first position, Mr. Pepik served as the vice president of ACFES, a Russian holding company. Afterwards, he founded and owned several private businesses in Russia including ACFES Land International.

He was the co-owner and president of a real estate and financing company. Additionally, he served as the co-owner and president of Diamond LLC, a plastic surgery clinic. Diamond LLC was the official, exclusive distributor in Russia for

Intaglio, an American cosmetic skin care line.

Other positions included serving as a member of the board of the Russian bank Vostokinvest Bank and being the co-owner and president of Dalwest LLC, a joint venture company with Nissan Corp., Japan. Mr. Pepik also worked with Nissan Corp.

He was the chairman of the international business advisory board for FLEXSCAN Inc., a California based publicly traded company. Before joining Megadata Web, Mr. Pepik was a representative for a Russian holding company, Berkut, in the United States.

“The goal is to turn data into information, and information into insight.”

- ***Carly Fiorina (Chief Executive Officer of Hewlett-Packard)***