

AJAY BHATNAGAR

SKILLS:

Accelerated design and development of lean, scalable, robust, production-ready software solutions. Expertise in multi-threaded architectures, performance tuning. Experienced in diverse technologies.

Cloud Ajax Android Axis C# C++ HTTP JMS JSON Java LAMP Linux MVC Mobile PHP Performance Tuning Perl RDF REST SMS Marketing SOAP Git Security Semantic Web Shells Websockets Social Networks SQL Threads Tomcat FHIR UIMA Unix VOD Python Web Windows XML IVR

RECOMMENDATIONS: http://www.expressotech.com/resume/ajay_recommendations.pdf

LINKED IN: http://www.linkedin.com/in/ajayexpresso

PATENTS:

- July 2019Systems and methods for generating and implementing database audit functionality across
multiple platforms. Patent number 10360203.
- June 2004 Method and system for logging into and providing access to a computer system via a communications network. Patent numbers <u>US7979900B2;GB2396037</u>.

PRODUCTS:

DynamicObjectPool Creator of <u>DynamicObjectPool</u> - a general purpose Object Pool that automatically and asynchronously grows and shrinks, to provide optimal resource usage, and scalability for multi-threaded **C#** and **Java** applications.

EXPERIENCE:

- Dec 98 Present Independent Consultant / Partner, eXpresso Technologies Inc.
- May 00 Dec 04 **Technical Lead / Cofounder**, Xenobit Corporation.
- Dec 97 Nov 98 Lead Engineer SupplyWorks Inc.
- Jun 96 Nov 97 **Principal Software Engineer**, ADSmart Corporation.
- Nov 95 May 96 **Principal Software Engineer**, Banyan Systems Inc.
- Nov 94 Oct 95 Senior Software Engineer, Banyan Systems Inc.
- Jun 89 Oct 94 **Software Engineer**, <u>Hewlett Packard Co</u>.
- Aug 87 May 89 Teaching Assistant, Dept. of Computer Science, University of Kentucky.
- Summer 86 Trainee, Uptron Digital Systems Limited, India

EDUCATION:

May 89M.S., Computer Science, University of Kentucky, Lexington KY. GPA 4.0/4.0.May 87B.S., Computer Science & Technology, Indian Institute of Technology, Roorkee India.



PROJECTS:

eXpresso Technologies Inc. (Technical Consultant)

May 19 – Present	 Client: McKesson Specialty Health / Ontada Individually responsible for the Infobutton (HL7) Integration for My Care Plus (Patient Portal) and iKM Oncology EMR with multiple sources - Healthwise and Lexicomp. This provided context aware Knowledge Retrieval for Patients. Technologies: Java, XML, JSON. Individually responsible for the HL7/SIU data import integration for My Care Plus Patient Portal. This DB level integration implemented Automatic Extension of Table Partitions to accommodate future data growth and provide performance and scalability. A robust logging mechanism was implemented using autonomous transactions for audit purposes. Notifications for data requiring manual intervention could be configured at a desired frequency. Technologies: Oracle. Senior member of the engineering team for iKM Oncology EMR. Responsibilities included design and development of core functionality, and mentoring junior team members. Enhancements for EHR launch of FHIR application. Implied Membership Semantics for User Groups. Auditable content support for Clinical Notes via versioning, including analysis for future Cloud based implementation. Implementation of various EHR Reports, and analysis for future Reporting Framework.
Oct 20 – Nov 20	 Client: True Fit (The Atom Group) Analysis and optimization of True Fit's Brand Recommendation Algorithm. Bottlenecks in the Python based web service were identified, and a two level cache implemented to help improve performance and scalability. A canonical representation of payload data was used to maximize cache hits. Technologies: Python, Memcache.
Oct 18 – Apr 20	 Client: Digital Pharmacist Design and implementation of the next generation Google Cloud based IVR Microservice. Technologies: Python, Falcon, Flask, REST, Redis, MySQL, Plum Dev. Individually responsible for the architecture and implementation of the Google Cloud based Voice Message Micro-service, used by IVR to store encrypted voicemails. Technologies: REST, Python, Flask, MySQL. Individually responsible for accelerated prototyping of a lightweight IVR solution across multiple platforms - Amazon Web Services, Plum Fuse, Plum Dev - to help decide corporate product strategy. Technologies: Amazon Connect, Amazon Lex (Speech Recognition). Individually responsible for the architecture and implementation of the Google Cloud based Configuration Micro-service, used across all Corporate customers. Technologies: REST, Python, Falcon, MySQL. A Lineage Validation Framework for RESTful URIs which automatically validates hierarchical URIs for correctness. An Entity Override Framework which allowed temporary, time period based, overriding of any configuration data.
May 11 – Sep 18	 Client: McKesson / McKesson Specialty Health Senior member of the engineering team for iKM Oncology EMR: Accelerated implementation of FHIR API Portal, which allowed Patients to authorize access to their health records from third party applications. Technologies: OpenID, Java, Oracle.





- Design and implementation of a Server Push Framework for which allowed User's to be notified about critical events in near real time. Technologies: Websockets, Java, Oracle, AJAX.
- HL7 Infobutton integration for <u>iKM Oncology EMR</u> and <u>My Care Plus</u> Oncology Patient Portal. This provides context aware knowledge retrieval for Patients and Doctors. Technologies: Java, XML, JBoss, Tomcat, GWT.
- □ Individually responsible for the EMR Scheduler subsystem. Responsibilities included stabilization, performance tuning, and several enhancements:
 - □ **Resource Availability Precalculation** (RAP) framework to optimize performance. **Patent submitted**.
 - □ **Outbound SIU Framework** which enabled integration with several third party systems.
- Architect for <u>My Care Plus</u> Patient Portal Backend.
 - Individually designed and implemented <u>Meaningful Use</u> compliant Secure Messaging Microservice, which allowed Patients to securely exchange messages with their designated helath care providers. Technologies: REST, Java, JMS. PHP, Oracle.
 - □ Shadow Audit Framework, which allows automatic audit trail implementation across multiple database plaforms. Patent submitted.
 - Individually designed and implemented Patient Portal integration with Onclogy EMRs, that enabled Patient enrollment, Health Data access, and provided <u>Meaningful Use</u> compliance. Technologies: Java, REST, SOAP, MySQL.
- Feb 11 Mar 11 Client: DataFirst Corporation
 - Individually responsible for design and implementation of DF Viewer, a GUI for the DataFirst Intelligent Archive System. Technologies used: .NET, WPF, XAML, SQL Server, Multi-Threading, DICOM.
- Nov 10 Dec 10 Client: Market Share Button
 - □ Individually responsible for overall System Architecture. Provided guidance for technology selection, schema design, security, performance and scalability.

Mar 10 – Dec 10 Client: Alphawolf Consulting

- Individually responsible for design and implementation of a native Android application. Technologies used: REST, JSON, HTTP, Multipart Posts. Android Technolgies used: Services, Activities, Broadcast Receivers, Content Observers, SQLite, Telephony, Location, Contacts, SMS Listener, Camera.
- Individually responsible for design and implementation of a Semantic Web application that ingests data from Twitter, Facebook and other social media sites, performs custom semantic analysis, and persists analysis data in a triple store. Technologies used: Java, REST, Active MQ, SQL Server 2008, AllegroGraph Web 3.0 Database, Memcached, OWL, RDF, N-Triples.
- Individually responsible for design and implementation of UIMAWeb, a web service providing a synchronous/asynchronous REST interface for custom semantic analysis of data. Support for various document formats (see below), including URL references to the same. Custom configuration capability allowed clients to specify unique configuration for each semantic engine. Aggregate results were provided in XML or JSON format and included data such as Entity extraction, Themes, Sentiment analysis, POS (part of speech) data, Classification information, etc. A lightweight verion of the system that used filesystem persistence, instead of a database, was implemented. Technologies used: Java, REST, Apache CXF, Active MQ, AJAX, UIMA, Lexalytics and ReelTwo.
- Individually responsible for design and implementation of system components for Text Extraction from various document formats such as PDF, HTML, and Microsoft Office formats (Word, Power Point, Excel). Technologies used: Java, Open Office API, PDF Box.





- Individually responsible for design and implementation of a heartbeat based system wide monitoring capability. A Heartbeat Sender component used reflection to generate JSON format heartbeats for POJOs and published them to a JMS Topic. A Heartbeat Monitor service subscribed to the appropriate JMS Topic and published an HTML version of the received heartbeats. Missing or unsolicited heartbeats were called out. A JMX-to-Heartbeat gateway allowed for integration of JMX only components. Reflection based multi-threaded design allowed for adding heartbeat capability to a POJO wih a single line of code.
- □ Individually responsible for design and implementation of adding <u>Mobivity</u> SMS Gateway support to **SMSML**, a **SMS** based **Mobile Marketing Application**.

Aug 09 – Mar 10 Client: Grob Technologies

Lead Architect for <u>WhatYouPost</u>, a web application for **semantic evaluation** of **Social Networking Content** from <u>Twitter</u>, <u>Facebook</u>, and various **blogging** sites. The application ingests data from various social networking sites, performs semantic analysis of ingested data, and then computes a score for the user based on this analysis. Computed scores can be used in various contexts, such as for evaluation by a prospective employer. Responsibilities included gathering requirements, evaluating and recommending relevant industry technologies, defining overall system architecture, providing detailed technical design, implementation of core system components, mentoring team members. Technologies used: Java, ActiveMQ, JMX, ROME, iText, Velocity, Apache, PHP, Codelgniter, Stomp, Postgres, Linux.

- □ Individually responsible for design and implementation of the core **Analysis and Score Computation Engine**.
- Individually responsible for design and implementation of several outward facing components, such as presentation of Score details, and *Disputes* functionality. The latter allowed end users to dispute specific credits/debits in their scores, and system administrators to approve/reject these requests, and rescore if required.
- □ Highly **tunable** and **flexible** score computation algorithm, based on **sentiment/tone analysis**, instead of naïve pattern matching.
- □ Extensible architecture allowed inclusion of multiple data sources, support for multiple scoring algorithms, dynamic specification of sentiment thresholds, occurance thresholds, watch-list contents, amongst others.
- □ Scalable, multi-threaded, loosely coupled, and distributed architecture for supporting increased data volumes.
- □ **Robust architecture** alerts personnel of all sysem error/warnings, and allows remote monitoring of system via **JMX**.
- □ Stepped in on several occasions to salvage at-risk components, while meeting aggressive schedules, and stringent quality requirements.
- Jun 09 Jul 09 Volunteer Work: Designed and implemented Diarrhea Protocol, and Immunization Schedule modules for a prototype of the **World Bank** award winning project <u>Arogya</u>, that alleviates the chronic shortage of medical care in rural areas by offering kiosk based healthcare assistance. Technologies used: **ASP.NET**, **SQL Server 2008 Express**.
- Aug 08 Aug 09 Client: Alphawolf Consulting Individually responsible for design and implementation of a realtime <u>Twitter Stream</u> <u>Reader</u>. The extensible design allowed for various message handlers (File, JMS, Database, etc.) to process the incoming stream. The solution was implemented using Java, ActiveMQ (JMS), and detailed remote monitoring capabilities were provided using JMX.
 - □ Individually responsible for design and implementation of SMSML a SMS based Mobile Marketing Application, which allowed execution of various marketing campaigns such



as Sweepstakes (e.g. Miller High Life Summer Boat Sweepstakes), Survey, Opinion Polls, etc. The extensible, state machine based, design allowed for support of diverse campaign semantics. The application was based on the MVC pattern, provided a **RESTful** management interface, a **SOAP** proxy, and was implemented using **Java**, Tomcat, Restlet, Axis, ActiveMQ (JMS), JMX, PostgreSQL.

- □ Individually responsible for design and implementation of a general purpose **multi**threaded, extensible State Machine. The design allowed for arbitrary state machine definitions via text files, custom event handler implementations, and synchronous/asynchronous, event handling options at runtime. The SMSML product above used the state machine to provide support for diverse campaign semantics. The solution was implemented using Java, and PostgreSQL.
- □ Individually responsible for design and implementation of **Ruby on Rails** based prototype of the SMSML application above.
- □ Individually responsible for design and implementation of APE (Abstract Processing Engine), a JMS based framework for arbitrary, loosely coupled, multi-threaded software components. The APE provided comprehensive remote monitoring capabilities of component aggregate/detailed statistics using JMX, and centralized exception collection/reporting. The APE implementation uses Java, ActiveMQ, JMX, PostgreSQL.

Sep 08 - Aug 09 Client: DataFirst Corporation

- Individually responsible for design and implementation of HyperMOD product, which П allowed scalable conversion of several legacy medical image formats to the standard **DICOM** format using multiple concurrent processes, and a distributed architecture. The design provided scalability, detailed logging, local/remote monitoring, auditing, and detailed error reporting. The solution was implemented using C++ on a Windows 2003 Server.
- □ Individually responsible for design and implementation of **OMA** (Online Medical Archive), the kernel filter driver based flagship Archive product, which unlike the legacy product had no dependencies on optical media. Design required understanding legacy implementation, using call tree analysis to isolate optical media dependencies. Final solution provided single code base between multiple product personalities, and provided ISAPI based monitoring module, peer keep-alive checks, event log monitoring/alerting including filters and bookmarks, scheduled Blat based email reports, and an updated Installshield installation. Provided comprehensive documentation, and training sessions for field personel. Solution was implemented using C++ on a Windows 2003 Server.
- Individually responsible for driving requirements and development for the next generation kernel filter driver for the flagship Archive product. Responsibilities included working with external vendor on a variety of issues related to the driver development and testing. Developed a C# based prototype, demonstrating the archive/restore functionality, that invoked the C++ driver interface using Platform Invoke on a Windows 2003 Server.
- □ Individually responsible for the port of the flagship Archive product from Visual C++ 6.0 to Visual C++ 2008. The product installtion was also ported from InstallShield to Windows Installer.

Aug 07 – Jun 08

Client: Newssift (A Financial Times / Pearson startup company)

Lead Architect, individually responsible for design and implementation of the Data Ingestion Pipeline for a Semantic Web Application (Web 3.0). The pipeline ingested published content from various online sources such as Fetch, Gale, analyzed the data using several **UIMA** based annotators, performed *voting* amongst the annotations, generated RDF/N3 representations of the annotations, and transmitted the content along with the annotations to a Siderean based web search application. The pipeline was implemented using Java, ActiveMQ (JMS), XML/XSL, Apache UIMA, Oracle, and was



deployed on Linux. The architecture ensured **performance/scalability** by maximizing **concurrent processing**, using **multi-threading** and using **dynamically asynchronously growing/shrinking object pools**, and numerous other optimizations. The flexible architecture allowed for the pipeline components to be deployed across multiple machines, and provided resilience due to the inherent loose coupling. Detailed remote monitoring capabilities were provided using JMX.

- Individually responsible for design and development of UIMA Annotators for <u>Nstein</u>, <u>Lexalytics</u>, and <u>ReelTwo</u>. Annotators were implemented using Java, Apache UIMA, XML, and provided detailed remote monitoring capabilities using JMX. The annotators also provided JMeter support to facilitate stress testing in a distributed environment.
- Individually responsible for the design and development of a SOAP interface to the various UIMA annotators. The service allowed non-UIMA client applications to request annotation of the specified content. The web service used a multi-threaded architecture and dynamically/asynchronously growing/shrinking object pools, to ensure performance and scalability. The service was implemented using Java, Metro, Tomcat, and Apache UIMA.
- Individually responsible for the design and development of a system wide Monitoring Application, which monitored the health of specified components, and periodically published an XHTML report detailing the status, including any error details. Heuristics along with state data were used to analyze and detect non-obvious error/warning conditions. The extensible architecture allowed for addition of new types of monitored components, and new report formats, e.g. RSS, ATOM, etc. The application was implemented using Java, and JMX.
- Individually responsible for the design and development of several web services. These services provided a REST style interface, and were implemented using AJAX, JSON, Java, Tomcat, Apache UIMA, and Oracle.

Dec 04 – Aug 07 Client: SeaChange International, Inc.

- Individually responsible for design, implementation, and integration of enhancements to the SeaChange Video On Demand (VOD) system for providing CAC (Call Admission Control) functionality support. As part of session setup/teardown, the VOD system communicated with the external Policy Manager using multi-threaded, asynchronous, SOAP/HTTP/HTTPS calls to reserve/release the required network bandwidth. Additionally, the Policy Manager could use the SOAP interface to request the VOD system to teardown an existing session. The solution was implemented using C++, gSOAP, OpenSSL,.NET, C# on a Windows 2003 server.
- Individually responsible for analysis, design, and implementation of the SOAP/HTTP/HTTPS based interface between SeaChange and external Vendor systems for Subscriber-Management, Billing, and Online-Signup data. The solution conformed to the plug-in based architecture of the SeaChange system, and included both, a SOAP client and a server. The SOAP server used a multi-threaded architecture to ensure performance and scalability. The solution was implemented using C++, gSOAP, OpenSSL,.NET, C# on a Windows 2003 server.
- Individually responsible for analysis, design, and implementation of the Comcast Entitlement Server Client, which provided real-time access to the entitlement data residing on the Comcast system. The client used XML/HTTP and XML/UDP based request/response messages. It was designed as a multi-threaded DLL and was implemented using C++, WinHTTP on a Windows 2003 server.
- Individually responsible for analysis, design, and implementation of Comcast Entitlement Server Simulator, which enabled SeaChange components, requiring entitlement information, to do functional/performance/scalability testing on an in-house basis. The simulator used XML/HTTP based request/response messages. It was designed as a



multi-threaded ISAPI DLL backed by a SQL Server database, and was implemented using C++, ADO, and stored procedures on a Windows 2003 server.

- Individually responsible for design, implementation, integration of modifications to the VOD system for integration with Juniper SDX. This integration allowed SeaChange and Juniper to demonstrate CAC (Call Admission Control) functionality. As part of session setup/teardown, the VOD system communicated with SDX using multi-threaded, asynchronous SOAP calls to reserve/release the required network bandwidth. The changes were implemented using an extensible plug-in architecture and C++, ATL, SOAP on a Windows 2003 server.
- Individually responsible for analysis, design and implementation of NGOD (Comcast led initiative for Next Generation On Demand Architecture) compliant prototypes for VOD Session and Resource Manager (SRM), and Purchase Server. Modifications were also made to the common DSM-CC protocol engine shared by all VOD components to allow for NGOD compliant messages. The prototype was implemented using a multi-threaded architecture, C++, XML on Windows XP.
- Individually responsible for design, implementation, integration, and related training of the Interim CAC solution for Verizon/Motorola. The VOD SRM was enhanced to periodically import information about the Verizon network topology delivered via XML files over Secure FTP. The session setup algorithm in the SRM was then enhanced to do a real time, asynchronous database lookup of the same information so as to complete the setup successfully. XML file processing reports were emailed out via integration with an SMTP server. The Expat parser was used to implement SAX style parsing of the XML files. The solution was implemented using a multi-threaded architecture, C++, XML, SQL Server on Windows Server 2003.
- □ Individually responsible for design, and implementation of the **SOAP** based plug-in for the **VOD Session and Resource Manager** (SRM). The plug-in allowed the SRM to integrate with third party systems that could allow/disallow a session setup request, or could teardown a session after it had been setup. The plug-in implemented a **multi-threaded**, **asynchronous** SOAP client and server. A simple **webserver** was implemented as part of the plug-in for the SOAP server functionality. The plug-in provided real time performance statistics, an active session table, and was implemented using an **extensible plug-in architecture** and **C++**, **ATL**, **SOAP**, **.NET**, **C#** on a **Windows 2003** server.

Mar 03 – Dec 04 Client: State Street Corporation.

- Technical Lead for Feed Processing component of the Enhanced Security Master application. This component implements data driven processing of incoming feeds using Java, XML, IPlanet, IBM MQ Series (Java Messaging), Oracle.
 - Individually responsible for re-architecture of the Feed Processing service to implement a multi-threaded model for enhanced performance, throughput and scalability. Profiling tools were used to benchmark performance, and identify bottlenecks. Significant gains were realized by the new multi-threaded implementation.
 - Project Management for enhancements required to process Bloomberg feeds. Feed Processing component was enhanced to handle parsing and processing of delimited data files in addition to fixed-length data files. Responsibilities included creation and maintenance of project schedule, analyzing project requirements, and advising team members on technical design.
- Technical Lead for Distribution component of the Enhanced Security Master application. This component implements multi-threaded distribution of data feeds to subscribers using custom formats, and custom data validation rules, collection and presentation of real-time statistics, using Java, IPlanet, IBM MQ Series (Java Messaging), Oracle. Responsibilities included creation and maintenance of project schedule, analyzing project requirements, advising team members on technical design, conducting code reviews, assisting in analysis/solution of performance issues.



- Individually responsible for managing external deployment of GTM (Global Transaction Management) suite of web applications implemented using Java, Servlets, JSP, Applets, IPlanet, IBM MQ Series (Java Messaging), Oracle. Responsibilities included creation and maintenance of project plan, design and implementation of Single Sign-On integration using Siteminder, identification of security vulnerabilities via code analysis and penetration tests, advising team members on solutions for the same, and coordination of various groups to facilitate project completion.
- Individually responsible for design and development of enhancements to <u>JASDEC</u> Trade Processing system for handling scenarios requiring manual intervention, such as asynchronous trade cancellation instructions. The system was implemented using **Java**, **Servlets**, **JSP**, **IBM MQ Series** (**Java Messaging**), **Oracle**, **IPlanet** web server. The enhancement included receiving trade/settlement cancellation instructions, implementing necessary state transitions for the trade, generating required workflow items, posting required cancellation instructions to external systems, and handling completion of workflow items.

Feb 02 – Jan 03 Client: Fleet Boston.

- Individually responsible for performance and scalability analysis and tuning for InvestmentLink, a web application for online trading, implemented using IIS, ASP, ADO, SQL Server. The analysis was done using Microsoft Web Application Stress Tool (WAS), which allowed specific areas of the application to be stress tested using a multithreaded client. Recommend solutions based on the analysis and evaluation of new technologies such as .NET. Responsibilities also included mentoring team members, leading code reviews and providing technical guidance.
- Redesign and re-implement key areas of InvestmentLink, including the core trade execution engine, to provide high throughput and scalability. Significant performance improvements were realized by identifying bottlenecks and addressing them using a variety of techniques such as optimizing calls to the database, making use of pregenerated data, adopting lazy data retrieval schemes amongst others.
- □ Implement **User Tracing** capability in InvestmentLink, which allowed real time tracing of active user sessions, and their usage of various portions of the applications. The tracked data was saved in the database and reports produced from it were used for **application capacity planning**.

Dec 01 – Feb 02 Client: NuSphere Corporation.

Design and implementation of a web application for managing various business aspects of sales leads. The application was implemented using PHP, MySQL, Apache, Linux. End users used the application to request evaluation copies of software products. The vendor could track/limit downloads based on a time window and/or maximum number of attempts. The application also generated email notifications for evaluations requests and approvals.

Jan 01 – Dec 01 Client: Fleet Boston.

- Design and implementation of the Customer Sales Database web application using ASP, ADO, Java, XML, Crystal Reports, IIS, SQL Server. The application imports monthly sales related data from a number of financial systems using a Java/XML framework. The imported data is then aggregated and presented via a Web User Interface which allowed users to view/edit the data, generate on-demand reports, and publish data to the General Ledger system.
- Design and implementation of the Private Equity Portfolio (PEP) Funds web application using ASP, ADO, IIS, SQL Server. The application was redesigned to retrieve sensitive data/text from a database, and allow hosting of the public and protected portions on different servers using different (HTTP / HTTPS) protocols. Domain level cookies were



used to communicate the current authentication status to the public site from the protected site.

- Design and implementation of the **PEPAdmin** web application using **ASP**, **ADO**, **IIS**, **SQL** Server. This web application provides administration of various aspects of the PEP web application, like uploading of fund data via excel spreadsheets using a C++ based COM object, maintenance of sensitive site data/text, creation/maintenance of user accounts, verification of new data using a staging application, and publication of staged data to the production database.
- Re-architect the **InvestmentLink** web application, which is implemented using **ASP**, ADO, IIS, SQL Server, to provide: integration with Event Log, an Error management scheme, efficient database connection usage, resizable image based screens, and various other features.

Dec 00 – Mar 01 Client: Itochu Corporation / L.H. Boyd & Company.

Design and implementation of FactoryLink, a web application for managing various п business aspects of leasing shipping containers and related equipment. The application was implemented using ASP, COM, ADO, IIS, SQL Server.

June 00 - Jan 01 Client: eHealthDirect / Xenobit Corporation.

- Design and implementation of **Global Login**, a single sign on system, using **JSP**, Servlets, Java Beans, JDBC, XML, Digital Signatures, Cryptography technologies. The Global Login system allows users to transparently login across multiple web applications, manage their profile information in one central location, and control how much of their profile information is shared with different web applications. Global Login benefits web applications by relieving them of implementing authentication functionality, and by minimizing stale user profile data.
- Design and implementation of **XenoPath**, a **Java** based light weight **multithreaded** message streaming Bean. XenoPath can be used by applications to stream messages to a variety of listeners/resources, for e.g. TCP/UDP listeners, disk files, SMTP servers, etc. The product architecture is extensible and users can easily add new types of message handlers. A multithreaded design allows the client application performance to be minimally affected as the message volume or number of listeners increases.

May 00 - Nov 00

Client: Communispace Corporation.

- Individually responsible for the re-architecture of the Communispace web based service to move to a clustered web farm solution The new architecture provided scalability and a highly modular approach for growing and managing the site. WLBS was used for providing load balancing and high availability in the clusters. Necessary modifications were made to the ASP and DB schema (SQL Server) for the clustered architecture.
- Design and implementation of the NT based **Mailer Service**. This service is responsible for generating various email notifications required by the Communispace Service, for e.g. Dialog Activity, etc.

Jan 00 – April 00

Client: Refer.com (An Idealab Company)

- Individually responsible for the design and implementation of the intranet and internet П Administration Web Sites for the WebHire Recruitment product. The sites were developed using IIS/ASP/ADO on Windows2000. A highly modular design allowed a high level of code reuse between the two sites. An optional checksum scheme was implemented for preventing cookie tampering in the internet version of the site.
- Design and implementation of the Windows2000 based **JobLoader Service**. This service was implemented using C++ and is the primary means of importing external application data in the WebHire Recruitment product. A multi-threaded architecture used in conjunction with **DCOM** provided load balanced approach for profiling the data being imported.



□ Evaluation of various performance optimization techniques for ASP applications.

June 99 – June 00 Client: **Open Market Inc**.

- Individually responsible for the design and implementation of COM Interfaces for Open Market's SecureLink, Multiltem, BuyerProfile and OrderEntry SDKs. These SDKs are used by storefront developers to interface with OpenMarket's flagship Transact product. The COM interfaces offer an easy to use high level API and remove the limitation of using C/C++ to access the SDK functionality.
- Individually responsible for the design and implementation of a Java Swing/JFC based Tree applet prototype. The Tree applet was implemented as part of a technology evaluation for the upcoming Open Market / FutureTense product. The applet provided significant performance gains via on-demand loading of arbitrary portions of the tree from the server. Other features provided by the applet included dynamic modifications to the Tree hierarchy, communication with JavaScript using LiveConnect, context menu support for nodes, etc.
- Jan 99 Dec 99 Client: **SupplyWorks Inc**. Design and development for various enhancements to the Internet based SupplyWorks **Business-to-Business ECommerce** Service. More details about the service are available in the SupplyWorks specific projects below.
 - Design and implementation of SupplyWorks Administration Web UI using ASP, DHTML, JavaScript. The Administration UI is used by the Buying Organizations to maintain corporate data required for B2B Purchasing via the SupplyWorks Service.
 - Designed and implemented the NT based Notification Service. This service is responsible for generating various email notifications required by the SupplyWorks Service, for e.g. Approval Requests/Rejections/Timeouts/Escalations.
 - □ Designed and implemented the Visual C++/ATL based COM interfaces implementing an extensible scheme for supporting Approvals based on Purchasing Limits.
 - Designed and implemented the NT based Order Submit Service. This service provided an asynchronous mechanism for transmitting submitted OBI Orders to Suppliers, thus relieving end users from the responsibility of repeatedly attempting Order Submission using the UI. The service attempted retransmission for failed Orders based on a heuristic algorithm. Email notifications were generated for successful and failed Orders appropriately.
 - Port of the Dynamic HTML based UI of the SupplyWorks service to Netscape Navigator 4.08. This UI was initially developed exclusively for MSIE 4.01. Individually responsible for porting JavaScript related functionality implementing frame synchronization, navigation aid, visual feedback, form validation, etc.
 - Designed and implemented the Visual C++/ATL based COM interfaces implementing an extensible scheme for supporting various Payment methods, like Amex, Visa, Bulk Invoice, etc.
- Feb 99 Client: **Agranat Systems Inc**. Individually responsible for initial port of the Agranat Embedded Web Server (**EmWeb**), and the Embedded Protocol Stack (**EmStack**) initial port to Embedded Cygnus Operating System (**eCos**). Integration of product source code in the cross platform build environment on Linux. The EmWeb service was run as a separate eCos thread. The SLIP related modules of EmStack were integrated with the eCos specific serial I/O calls. An initial version of the port was tested on the eCos simulator for the Matsushita chip running under Linux.
- Dec 98 Jan 99 Client: **Nokia / Agranat Systems Inc**. Design and development of EM (Element Manager) for the Nokia Eksos-I20 product. The EM provided a Web UI for administering the various components of the Eksos-I20 product like PPP, ATM, XDSL, Ethernet, etc., and was implemented using the Agranat Embedded Web Server (EmWeb). The administrative functions were implemented using the Nokia Management Data Interface (MDI). Contributed



to the Linux/GNU based build infrastructure, and the C++ based EM architecture. Individually responsible for the PPP section of the EM UI.

SupplyWorks Inc.

- Dec 97 Nov 98 Architect for the Internet based SupplyWorks Business-to-Business ECommerce Service. The service provided the buy-side functionality of the Open Buying on the Internet (OBI) industry standard, and enabled Buying Organizations to conduct MRO purchasing online. The service was used as the ECommerce offering for the American Express Corporate Purchasing Card. Responsibilities included designing all aspects of the service including security, scalability, reliability, monitoring, etc. The service was implemented on Windows NT using IIS, ASP, MTS/COM, and SQL Server.
 - Designed and implemented the Visual C++/ATL based COM interfaces for the service User Interface. The interfaces provided Digital Certificate based User Authentication, Encapsulation of Data Access / Modification using ADO and ODBC, Component based transactions, Receiving/Unmarshalling and Marshalling/Transmission of OBI 850 Documents, Signatures and Verification of Digital Signatures on Documents, Base 64 Encoding / Decoding, Email Order confirmations, detailed event logging for error reporting and tracing.
 - Technical Consultant for Supplier ECommerce Enablement. Worked with VWR Scientific, Boise Cascade, Xpedex, and other Suppliers to resolve technical issues related to interoperability with the SupplyWorks ECommerce service.
 - Designed **XML DTD** for OBI 850 Documents.
 - Designed and implemented Event Monitoring/Notification for SupplyWorks Service. This Perl based service monitored Production Server Event Logs, filtered relevant events and enqueued them for notification. Email notifications containing the event details were sent out periodically to one or more people.
 - Designed Order Limits/Approvals functionality for the SupplyWorks ECommerce service.

ADSmart Corporation (A CMGI Company)

- Jun 96 Nov 97 Lead Engineer for ADSmart Adserver/Runtime development, a proprietary high performance, multithreaded, object oriented HTTP server customized for delivering targeted advertisements on the Internet. The Adserver memory mapped all advertising content to eliminate any disk access when servicing ad requests. The server was developed in C++ on Solaris. The decision logic for choosing the advertisement was implemented in a shared library which the server opened dynamically. This library was regenerated and pushed out to the server machines on a regular basis to update Campaign information. This shared library contained automatically generated C++ code for scheduling Campaigns at relevant Websites and enforcing any constraints the Campaigns might have for choosing their target audience.
 - Designed and implemented the interface for extracting Campaign and Website information from the ADSmart Oracle Database using Perl/DBI and then generating C++ code using a LEX/YACC based parser.
 - Designed and implemented runtime capability for real time User Profile based targeted advertising. This allowed ADSmart to gather information about Website visitors and then use this information to display advertisements based on the user's interests and demographics. The user profiles were stored as bit vectors accessible through a hash table. C++ code was generated in the decision logic library to test for Campaign specific user attributes.
 - Designed and implemented runtime functionality for per User Campaign/Creative Limits and Creative Sequencing. Campaigns could specify the maximum number of impressions that could be delivered to a single user for the Campaign/Creative. Sequencing could be used to enforce the order in which creatives were shown to a user. The Adservers used a multithreaded work queue model to dispatch requests to and process responses from a



central history daemon that maintained records of creatives seen by a user. The history daemon used **Oracle/OCI** to extract information from the database and also implemented an in memory cache to provide real time response to the Adservers.

- Designed and implemented enhancements to the ADSmart Runtime to serve Advanced Creatives, taking the company beyond the banner ad paradigm. This functionality allowed the runtime to extract creatives of multiple (HTML/Java/ShockwaveFlash) format from the database, detect browser support for optional formats using dynamically generated JavaScript code, deliver the Creative and associated Components, and process the click through requests. Other runtime enhancements included delivery of Interstitial Ads and Jump Pages.
- Prototype for Website Traffic Analysis and Inventory Management. Designed and implemented utility to build statistically valid models of visitor attributes at site content areas. A thousand visitor sample was randomly chosen and the user attributes stored using bit vector representation. This model could be used to short-list relevant sites for Campaigns with specific Target Audience criterions. This prototype was further extended to implement inventory management of impressions at content areas. A bit vector of user-taken records was computed for each content area to indicate which portion of the user population had already been booked by Campaigns.
- □ Initial **Windows NT** port of Adserver/Runtime.
- □ Initial prototype of **Java** based Campaign Manager User Interface. The Campaign Manager allowed users to design Advertising Campaigns, specify flighting/scheduling information, build custom target audience segments, select Website content areas from a dynamically generated recommendation list, specify desired impressions at each of the selected content areas, and reserve the selections.
- D Prototype for Campaign Impression allocation using LP software

Banyan Systems

- Jun 95 May 96 **Technical Lead** for the NT Group, responsible for **Banyan's Client Product** on **Windows NT**. Responsibilities include designing/developing software for the Kernel Network Driver implementing the VINES Protocol Stack, tracking **Winsock** Standard compliance, preparing/tracking project schedules, overseeing/assisting junior engineers, conducting code reviews, etc. Have been lately involved in taking Banyan's Directory Service - StreetTalk - to NT.
 - □ Individually responsible for the **VINES Server Protocol Stack** on Windows NT. This included implementing the VINES Routing functionality, several ioctls and stack configuration functions. This component is the most critical piece of Banyan's Server Solution on NT.
 - Independently implemented Performance Monitoring Support in the VINES Protocol Stack on NT. This capability allows users to view various performance characteristics of the protocol stack - Bytes sent/received per sec, Input/Output errors, Routing Statistics, etc. - from the Windows NT Performance Monitor, and is essential in troubleshooting networking problems and analyzing the performance of the stack.
 - Worked jointly with a group engineer to implement UDP Encapsulation capability in Banyan's NT Client. This capability encapsulated VINES IP packets within UDP/IP packets and allowed Banyan NT Client Workstations to be used in TCP/IP only segments of a network. It also allowed users to leverage the NT dial-in solution - RAS - to access their VINES network remotely.
 - □ Worked independently, as well as assisted other group engineers in addressing several critical issues holding up the release of Banyan's NT Client Version 5.56(30). Played a key role in releasing this product which later received considerable positive feedback from customers regarding it's enhanced functionality and robustness.
- Nov 94 May 95 **Technical Lead** for Banyan's **File Service** products. Solved various outstanding File



Service issues for the VINES 6.0 release. Implemented a scheme for exporting StreetTalk File Service names to Macintosh clients using StreetTalk attributes. Wrote several white papers explaining technical implementation details, for e.g. the native threads package used by the File Service. Scoped future projects like Long File Name Support in Banyan File Services, and Banyan File Services over TCP/IP.

Hewlett Packard

- May 93 Oct 94 Member of the R/D team responsible for **Performance Tuning** of the **HP/OSF DCE** product. Responsibilities included analyzing the DCE code, obtaining execution profiles, finding performance bottlenecks, prototyping corresponding workarounds, and testing the prototype for performance gains.
 - □ Independently made several enhancements to the DCE **Threads** and RPC code which resulted insignificant performance increases in the HP DCE product.
 - Identified several tuning opportunities for the runtime DCE IDL library responsible for marshalling/unmarshalling of DCE RPC data. Implemented optimizations for the various bottlenecks which resulted in efficient memory utilization and increased the performance of the IDL marshalling engine.
 - Developed a tool pdiff, for comparing execution profiles. This tool compared execution profiles and identified the differences between them. It was instrumental in analyzing the performance of different software baselevels and identifying the causes of performance degradation from one baselevel to another.
- Feb 93 Apr 93 Member of the R/D team for the **Task Broker** product. Designed and implemented a demo for the product unveiling. The demo implemented a parallel make utility by using the Task Broker to distribute compilation jobs in a cluster of workstations.
- Nov 92 Jan 93 Member of the R/D team for **Cluster Computing**. Ported PVM and HeNCE to HP-UX workstations. Responsibilities included evaluating several parallel programming tools like Linda, PVM, HeNCE, PICL, Paragraph.
- Jun 89 Oct 92 Member of the R/D team responsible for **NFS/NIS** on Domain O/S. Job responsibilities covered all aspects of the project including porting, coding, design and implementation, testing, performance evaluation and customer contact. Very familiar with NFS, NIS, RPC and Secure RPC internals. Worked on various sub-projects:
 - Developed interface tying NIS to the Domain O/S Registry. This allowed a single authentication scheme to be used in a heterogeneous cluster of workstations.
 - □ Converted the nfsd implementation from a single-process model to a multi-process model, which resulted in increased availability of the NFS server machine.
 - □ Implemented a transaction cache for the nfsd. This helped the NFS server eliminate redundant processing and reduced the network load.
 - Performance analysis of NFS. A comprehensive performance analysis of the NFS server was done by using code instrumentation techniques. The cost for a variety of filesystem operations was obtained and then broken down into the network, NFS layer, and the local filesystem cost. This helped isolate bottlenecks in the NFS implementation.