

Fifth Generation Computer Corporation

FGC Report No. 1

Version 2.0

ORIGINS OF THE FGC/MP-7 MULTIPROCESSOR SYSTEM

By Thomas O. Jones

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FGC Technical Report No. 1

ORIGINS OF THE FGC/MP-7 MULTIPROCESSOR

Fifth Generation Computer Corp. was founded in New York in 1984 to design and develop special purpose parallel processors used in pattern matching applications. FGC's designs are based on patents first assigned to Columbia University by the Defense Department and now assigned solely to the Company. In 1985, FGC entered into teaming agreements with AT&T to obtain a significant DARPA contract under the U. S. Defense Department's Strategic Computer Program to design and develop a Multiprocessor System based on FGC's novel and innovative parallel processors. The contract was awarded to AT&T and FGC, as its major subcontractor, in 1986 and proved to be very successful in demonstrating a new approach to real-time continuous speech recognition. We have included a copy of the Press Release announcing the contract award in Appendix A.

Use of FGC Technology in AT&T Automatic Speech Recognition (ASR) System

Automatic and continuous speech recognition was an application ideally suited to the FGC binary tree computer system. In order to correctly identify an unknown speech utterance, an ASR system had to perform millions of simultaneous pattern matching tasks. Real time continuous speech recognition had eluded researchers for years because of the massive computing power needed to simultaneously process the calculations needed to decode speech sounds and successfully match them against a library of speech templates made up of a set of statistical parameters.

One of the first objectives of the DARPA contract was to demonstrate the use of the DADO/DSP binary tree computing system in recognizing speaker independent continuous speech in real time. This goal was successfully demonstrated within the first year after the award of the contract to AT&T and FGC. In 1994, AT&T successfully installed a version of the system, named the AT&T BT-100, throughout its public telephone network at an announced savings of \$900 million per year according to their press release of February 10, 1994 (See Appendices D, E and F).

AT&T Proposal to License FGC Technology

As the result of negotiations that had begun in 1988, AT&T offered to license FGC Technology in a proposed license, dated October 12, 1988. The proposed license which we have included as Appendix B to this report clearly indicates that FGC Technology is being used in the AT&T BT-100 system.

FGC and AT&T were unable to agree on reasonable terms. FGC filed suit in New York State Supreme Court against AT&T for breaches of contracts and other issues. In September 1996, FGC and AT&T reached a settlement in federal court where the case had been joined with another action.

Technology Evolution and Achievements

In Figure 1 on the following page, we have outlined the early development stages of the FGC binary tree computer system as it evolved from a research project at Columbia University through the joint development efforts with AT&T up to the design of the FGC/MP-7 Multiprocessor System.

Patents

FGC is the owner of three parallel processing patents based on the first reduction to practice of the binary tree architecture in a computer system. Two of FGC's patents were issued to Dr. Salvatore Stolfo at Columbia University in 1989. These were first assigned to Columbia University but, in 1996, they were assigned to FGC. The third patent for a parallel processor was issued in December, 1999 to James Maddox, FGC Director of Engineering, and assigned to the Company. Systems based on this FGC technology have been in use in the military for over ten years.

Complete Patent documents and drawings are available on the US Patent and Trademark Office Website at www.uspto.gov. To locate the FGC patents, search on the following patent numbers:

6,000,024	Parallel Computing System
4,860,201	Binary Tree Parallel Processor
4,843,540	Parallel processing method

Appendices Relating to the Joint Development Effort with AT&T

Appendix A: AT&T Press Release dated October 13, 1986 announcing the contract award to AT&T with FGC as its major subcontractor.

Appendix B: Proposed AT&T Release and License, 1988.

Appendix C: "A Real Time Connected Speech Recognition System Using Hidden Markov Models," Abstract of AT&T presentation given at 1989 SpeechTek Symposium.

Appendix D: AT&T press release of March 3, 1992 describing its intent to deploy voice-recognition technology nationwide" The Release includes a brief description of the technology.

Appendix E; "Reach Out and Pronounce This, What AT&T is Doing with its Voice Recognition Technology," The article, published in Computer Shopper, September 1993, describes the use of the BT-100 as the core system being installed throughout the network.

Appendix F: AT&T press release of February 10, 1994 announced "savings of \$900 million per year as new technology is deployed and management layers are reduced."

ORIGINS OF AT&T BT-100 AND FGC/MP-7 TECHNOLOGIES

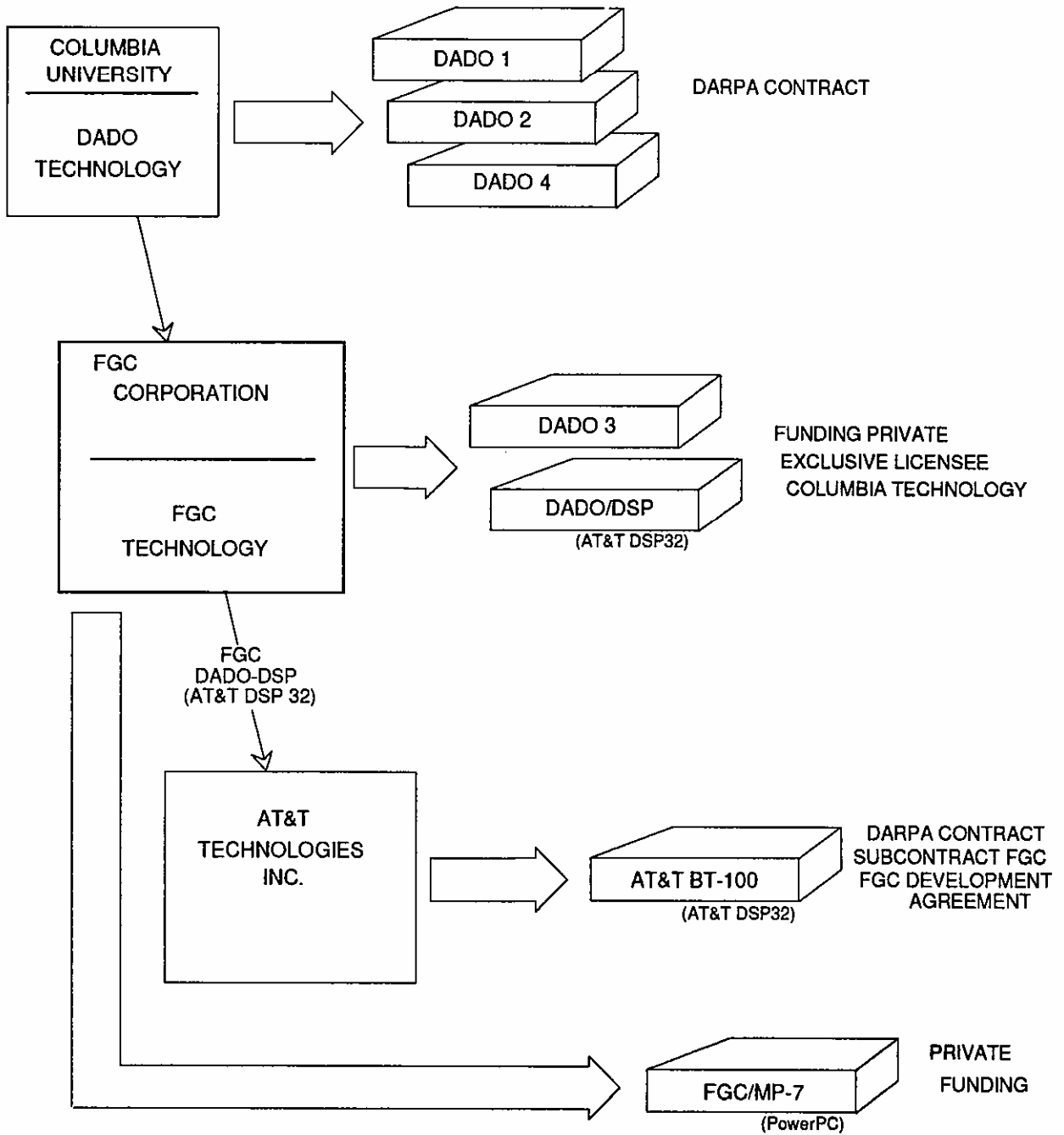


Figure 1

FGC's Patented Binary Tree Computer Architecture and Methods

In the binary tree computer architecture, each processing element (PE) represents a node that branches to two connected nodes, sometimes referred to as the left child and the right child, each of which continues on to the next level. This architecture is especially suited to perform compute-intensive "pattern matching" functions that must compare/compute an unknown input to a large set of known possibilities, allowing for various forms of distortion and/or incompleteness in the unknown.

The system can scale up to millions of processing elements especially using technologies such as embedded computer systems or systems on a chip (SOC).

The term, "Binary Tree Computing," now appears in the literature under several names, such as "Global Tree Computing" and "Hierarchical Computing."

It is a highly efficient architecture for designing large arrays of processors.

Use of the Binary Tree Architecture in the IBM Blue Gene System

For example, as a spin off from its Blue Gene System development project, IBM has filed a Patent Application, No. 20040078493, entitled, "Global tree network for computing structures."

The following is IBM's description of the "Background of the Invention" (which FGC believes is highly dependant on FGC's patents):

"This invention relates generally to the field of distributed-memory message-passing parallel computer design and system software, and more particularly, to a novel method and apparatus for interconnecting individual processors for use in a massively-parallel, distributed-memory computer, for example.

"Massively parallel computing structures (also referred to as "ultra-scale computers" or "supercomputers") interconnect large numbers of compute nodes, generally, in the form of very regular structures, such as grids, lattices or tori.

"One problem commonly faced on such massively parallel systems is the efficient computation of a collective arithmetic or logical operation involving many nodes. A second problem commonly faced on such systems is the efficient sharing of a limited number of external I/O connections by all of the nodes. One example of a common computation involving collective arithmetic operations over many compute nodes is iterative sparse linear equation solving techniques that require a global inner product based on a global summation.

"The normal connectivity of high-speed networks such as the torus is simply not fully suited for this purpose because of longer latencies.

“That is, mere mapping of a tree communication pattern onto the physical torus interconnect results in a tree of greater depth than is necessary if adjacent tree nodes are required to be adjacent on the torus, or a tree with longer latency between nodes when those nodes are not adjacent in the torus.

“In order to compute collective operations most efficiently when interconnect resources are limited, a true tree network is required, i.e., a network where the physical interconnections between nodes form the nodes into a tree.”

Summary of Achievements

1. Fifth Generation Computer Corporation (FGC) was the major sub-contractor to AT&T in a US Defense Department DARPA contract in the late 1980's which first Demonstrated real-time continuous speech recognition capability in a large Telephone network.
2. FGC, using technology licensed from Columbia University, built the first prototype of a DSP-based massively parallel processor which led to a major deployment of these units in the largest telephone network in the world.
3. Another version of this prototype, the AT&T BT-100, was deployed in hundred's of military installations around the world for use in high level research utilizing the power of massively parallel computing technology.
4. In 1997, FGC designed, built and delivered the FGC/SRS Speech Recognition MP-7 Server, utilizing 42 off-the-shelf Intel Pentium boards, to its first customer, US West, in less than six months from order date. This system handled over 400 million requests from customers and was in continuous operation for over six years without one system failure. To maintain and monitor the system, FGC designed a remote link, based on secure Internet technology, to move updates and modifications from our New Jersey Systems Center to the US WEST (now Qwest) facility in Minneapolis, Minnesota over the Internet. The operating system used as the basis for the MP-7 Load Balancing Software System is Linux.
5. FGC obtained its third parallel processing patent in December, 1999.



News Release

For further information:

Appendix A

Michael Jacobs, AT&T Bell Laboratories
(201) 564-4097 (office)
(201) 736-0939 (home)

For Release October 13, 1986

AT&T to Build Parallel Processor

Whippany, NJ -- AT&T has been awarded a contract from the Defense Advanced Research Projects Agency (DARPA) to develop prototypes of a computer that can recognize speech and images and do other complex pattern-matching tasks in a fraction of the time of today's best computers.

"These machines should bring us an important step closer to systems that can recognize large-vocabulary human speech as fast as it is spoken, a goal that has eluded computers up till now," said Robert Lewine, head of the Special Systems Design Department at AT&T Bell Laboratories.

The AT&T machines will be parallel-processing computers, considered by many to be the next wave in high-speed computing. Parallel-processing computers harness numerous small processors to divide and conquer a problem, executing many operations in parallel rather than one at a time.

- more -

The contract is worth about \$7.7 million to AT&T over a three-year period. It was awarded under the Strategic Computing Initiative, an ambitious Pentagon program that is funding research into several new computer technologies. Scientists at AT&T Bell Laboratories, where the work will take place, expect to have the first working prototype ready by next spring.

AT&T's subcontractor on the project will be Fifth Generation Computer Corporation of New York City. Salvatore Stolfo, Fifth Generation's chief scientist and an associate professor at Columbia University, has conceived a parallel-processor architecture, called Dado, that will be the basis of the AT&T machines.

AT&T will extend the Dado architecture to speech and image recognition and to other tasks involving sophisticated signal processing. AT&T will also develop software to control the computer. "We plan to demonstrate that this new architecture can compute solutions to other problems that are currently considered too complex for today's computers," said Lewine.

"Our major challenge is to understand how to partition a problem into hundreds or thousands of small pieces so that the multiple processing elements can be used with high efficiency," said Allen Gorin, the principal investigator on the Bell Laboratories project. "We already know how to do this for speech recognition," he said, "and are extending our studies to many other areas of signal processing."

#

Additional Technical Information

To demonstrate the power of its parallel-processing architecture, the AT&T machines will run speech-processing algorithms currently under development at AT&T Bell Laboratories. These algorithms involve comparing unknown speech patterns against a library of reference patterns. In the AT&T machines, all these comparisons will be performed simultaneously, thereby executing these algorithms fast enough to keep pace with normal speech.

Each processing node in the machines will consist of a microprocessor, a digital signal processor, and some memory and input-output hardware. The Dado architecture links processing nodes in a so-called binary tree architecture in which each node communicates only to a "parent" node and two "descendents," thus forming a "family tree" of related processors. Data flows into the tree through a root processor and is broadcast from parents to children throughout the tree. Results from parallel processing efforts are then passed back to the root processor, with comparisons and decisions made along the way.

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RELEASE AND LICENSE

Appendix B

This Agreement is made, entered into and is effective this day of _____, 1988, by and between Fifth Generation Computer Corporation, with offices located at 232-B East 68th Street, New York, NY 10021 (hereinafter referred to as "FGC") and AT&T Technologies, Inc. with offices located at Guilford Center (P.O. Box 20046), Greensboro, North Carolina 27420. AT&T Technologies, Inc. enters into this Agreement for the benefit of, and on behalf of, itself, its parent, American Telephone and Telegraph Company, and their respective subsidiary and affiliated corporations (hereinafter referred to severally and collectively as "AT&T").

WHEREAS, FGC was organized for the purpose of developing and commercializing parallel computer systems based upon technologies originated in the Computer Science Department of Columbia University in the City of New York (hereinafter referred to as "Columbia") under the name "DADO;" and

WHEREAS, FGC has a worldwide exclusive license from Columbia to develop, manufacture and market computer systems based upon the DADO technology; and

WHEREAS, AT&T and FGC have entered into a First Teaming Agreement, effective January 31, 1985, relating to cooperative efforts associated with the Multiprocessor System Architecture Program; and

WHEREAS, AT&T and FGC have entered into a Second Teaming Agreement, effective December 3, 1985, relating to cooperative efforts on certain other projects;

WHEREAS, AT&T and FGC have entered into an agreement, dated May 28, 1986 and amended July 1, 1986, relating to Decision Processing Peripheral Demonstration (hereinafter, the "DPP Agreement"), under which AT&T developed and supplied to FGC certain demonstration software; and

WHEREAS, there remains unpaid a balance due from FGC to AT&T under the DPP Agreement; and

WHEREAS, FGC is desirous of satisfying its outstanding obligations to AT&T under the DPP Agreement;

WHEREAS, FGC and AT&T desire to resolve any possible questions regarding respective rights in intellectual property relating to parallel processing computer systems and related software;

NOW THEREFORE, in consideration of the mutual promises contained herein, the parties agree as follows:

1. DEFINITIONS

All terms appearing below in all-upper case letters (other than the names of the parties and Section headings) shall have the respective meanings assigned to such terms in the Definitions Appendix hereto.

2. RELEASE BY AT&T

AT&T hereby forgives and releases FGC from all obligation to pay the remaining balance due from FGC to AT&T under the DPP Agreement. All other obligations under the DPP Agreement, including continuing obligations regarding the confidentiality and limitations on use of AT&T information and deliverables, remain in full force and effect.

3. RELEASE BY FGC

FGC hereby remises, releases, and forever discharges AT&T (including AT&T Technologies, Inc., its parent, American Telephone and Telegraph Company, a New York corporation and their respective subsidiary and affiliated corporations), the past and present officers, directors, employees, agents, subsidiaries, affiliates, successors, and assigns of each of them, and the heirs, executors, trustees, administrators, successors and assigns of any such persons and entities (the "Releasees") of and from any and all manner of actions, causes of action, suits, claims, and demands whatsoever, at law or in equity, other than for negligence causing personal injuries to a natural person, which against any of said Releasees FGC or any of its subsidiaries, affiliates, successors, or assigns ever had, now has, claimed to have had, now claim to have, or hereafter can, shall or may claim to have for or by reason of any cause, matter or thing whatsoever, from the beginning of the world to the effective date of this Agreement.

FGC warrants that it has not assigned, pledged, hypothecated, or otherwise divested itself or encumbered all or any part of any of the claims being released hereby and that it will indemnify and hold harmless any Releasee against whom any claim so assigned, pledged, hypothecated, divested, or encumbered is brought; and each individual executing this Release on behalf of FGC hereby personally warrants that the Release was authorized in the manner required by applicable law, that the Release complies in all other respects with governing law, that the Release is fully binding on FGC; and that FGC has authority to execute this Release on behalf of its subsidiaries, affiliates, successors and assigns.

This release by FGC may not be modified orally, and no alleged oral waiver of this Release shall have any force or effect.

4. LICENSE TO AT&T

FGC hereby grants to AT&T, commencing on the effective date of this Agreement, an irrevocable, nontransferable, nonexclusive worldwide license under FGC TECHNOLOGY to make, have made, import, have imported, use, have used, lease, sell and otherwise dispose of COMPUTER SYSTEMS using, incorporating, requiring, being based in any way on, or in any way relating to FGC TECHNOLOGY.

FGC represents that FGC has the right to grant licenses or sublicenses to AT&T of the scope recited in this Section 4 covering FGC TECHNOLOGY, including that referred to as DADO technology (and patents relating to such DADO technology) pursuant to rights granted by Columbia University to FGC. AT&T relies on such representation by FGC and reserves the right to require further adequate written assurances and/or documentary evidence that FGC has such right before any payment is made by AT&T pursuant to Section 5.

Except as provided in Section 5, this license shall be free of all obligation by AT&T to make payments of any kind and, in any event, shall be free of all royalties.

It shall not be deemed a failure of consideration if AT&T has otherwise received rights duplicative, in whole or part, of rights granted under this Section 4.

5. PAYMENTS TO FGC

AT&T shall, subject to the provisions of Section 4, pay the sum of fifty thousand dollars U.S. (\$50,000.00) to FGC within ninety (90) days after the effective date of this Agreement.

AT&T shall make payments to FGC based on sales made by AT&T after the effective date of this Agreement to third parties of AT&T's Model BT-100 processor in accordance with the following schedule

For UNITS	
1 through 350	Nothing (\$0.00)
For each UNIT	
in excess of 350	Three percent (3%) of NET SELLING PRICE of the UNIT, or two thousand U.S. dollars (\$2000.00) per UNIT, whichever is lesser.

UNITs are identified by the order in which they are sold; e.g., UNIT 1 is the first to be sold, UNIT 251 is the two hundred fifty- first to be sold.

The parties agree that the amounts paid or to be paid by AT&T under this Agreement, including this Section 5, and releases granted by AT&T hereunder, represent complete consideration for promises, releases, grants and other undertakings by FGC under this Agreement and do not in any way constitute a royalty or otherwise reflect value received for use or incorporation of FGC TECHNOLOGY, if any, in AT&T's Model BT-100 processor.

6. CUSTOMERS

FGC agrees not to assert any claim for infringement or for the unauthorized use of FGC TECHNOLOGY for the use, import, sale, lease or disposal by any other means by customers, mediate and immediate, of COMPUTER SYSTEMS which, in the first instance, are sold, leased or otherwise disposed of by AT&T. Accordingly, the license granted pursuant to Section 4 above is extended to such customers, but only to the extent necessary to permit such use, import, sale, lease or other means of disposal, and in no event shall any license to make or have made extend to such customer.

7. ENTIRE AGREEMENT

The terms and conditions contained in this Agreement supersede all prior oral or written understandings between the parties and shall constitute the entire Agreement between the parties respecting the subject matter hereof. There are no understandings or representations, express or implied, not expressly set forth herein. This Agreement shall not be modified or amended except by a writing signed by both parties.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be duly executed.

**FIFTH GENERATION
COMPUTER CORPORATION**

AT&T TECHNOLOGIES, INC.

By _____

By _____

Title _____

Title _____

Date _____

Date _____

DEFINITIONS APPENDIX

COMPUTER SYSTEMS means all equipment, apparatus, computer programs, microprograms, components, subassemblies, modules, processing elements and all portions and combinations of them which are adapted, either singly or in combination, to processing information in any form or medium.

FGC TECHNOLOGY means all ideas, designs, algorithms, data, computer programs, inventions, patents, copyrights, trade secrets, proprietary information or intellectual property rights of any kind (severally and collectively, "technology") now existing which FGC owns or to which FGC has the right to grant a license for any one or more of the following: to make, have made, use, have used, sell, lease, import, have imported, or otherwise have disposed of.

Except as provided below, **FGC TECHNOLOGY** shall include only such technology as has been (i) disclosed or otherwise provided to AT&T (or in the case of intangible intellectual property rights, such rights as protect, cover or otherwise relate to any technology so disclosed or otherwise provided) by anyone prior to the effective date of this Agreement, or (ii) developed by AT&T.

Notwithstanding any language to the contrary otherwise included in the foregoing, **FGC TECHNOLOGY** shall include patents for inventions made prior to the effective date of this Agreement for which no patent has issued as of the effective date of this Agreement which FGC owns or to which FGC has the right to grant a license with a scope consistent with Section 4, above.

NET SELLING PRICE means the price charged to customers for each UNIT, less taxes and charges for packing, crating, handling and transportation.

UNIT means that apparatus portion of AT&T's Model BT-100 processor consisting of an array of AT&T DSP processor chips permanently configured in a binary tree configuration with associated control and memory circuitry, all of which chips and circuitry are mounted on one or more printed circuit boards, the totality being arranged to be interconnected by backplane and chassis apparatus within one or more cabinets to a single host computer. More particularly, UNIT consists of such apparatus of a design provided to the United

States Government or its designees and described in pertinent part in AT&T drawings J-1C258 BT-100 System Assembly.

UNIT does not include:

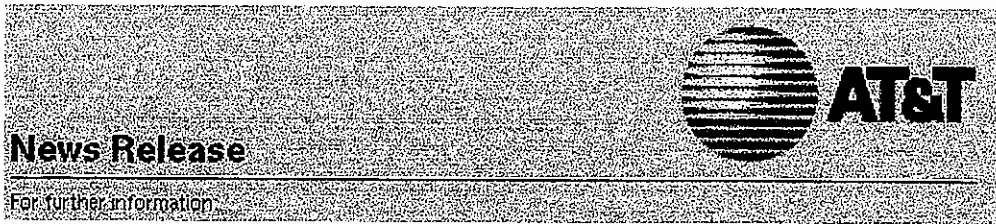
- (i) system or application software, including computer programs or other sequences of instructions for controlling programmable chips, processors or other apparatus, nor**
- (ii) system or application firmware, including computer programs or other sequences of instructions for controlling programmable chips, processors or other apparatus, nor**
- (iii) documentation (including training courses or materials) related to the use of AT&T's BT-100 processor or software or firmware intended for use thereon, nor**
- (iv) any host or control processor external to the array, nor**
- (v) any peripheral apparatus external to the backplane, chassis and cabinet, nor**
- (vi) any processor, array, system or configuration other than AT&T's Model BT-100 processor as defined herein.**

A REAL TIME CONNECTED SPEECH RECOGNITION SYSTEM USING HIDDEN MARKOV MODELS

P. Ramesh
D.B. Roe
A.L. Gorin
Speech Research Department
AT&T Bell Laboratories

This presentation describes a PC-based system for recognizing grammar-constrained connected speech in real time, using Hidden Markov Models. The heart of the system is the BT-100 parallel processor that can grow in computation power as the difficulty of the speech recognition task increases in terms of vocabulary size, language complexity and speaker independence. Real time speech recognition has been achieved with the system for a 70-word

data entry task and a 132-word airline reservation system. Recognition results obtained are also presented.

**Appendix D****EDITORS NOTE:**

Following the release are backgrounders on voice recognition technology and AT&T's plans to assist operators affected by new technology. Also attached is a list of offices closing or expected to close.

Mark Siegel

908-221-8413 (office)

201-366-6863 (home)

Burke Stinson

908-221-2062 (office)

201-377-0902 (home)

FOR RELEASE TUESDAY, MARCH 3, 1992

BASKING RIDGE, N.J. -- AT&T today announced it will deploy voice-recognition technology nationwide to automate many long- distance calls now handled by operators. Developed by AT&T Bell Laboratories, this technology recognizes and responds to the human voice.

The company reached this decision after two trials of voice recognition in the Dallas-Forth Worth area. The trials showed that this breakthrough in technology is easy to use and gives customers more choice in how they make long-distance calls.

Voice recognition will keep the costs of calling reasonable, provide a platform for future services, and ensure that American consumers get the full benefit of innovative technology.

Based on a growing trend among callers to place long- distance calls without operator assistance, on other recent improvements in operator-services technology, and on the introduction of voice recognition, AT&T will eliminate, by the end of 1994, 200-400 management and 3000-6000 non-management positions from its operator services organization, and will close 31 offices in 21 states. The company currently employs about 18,000 operators.

The company's objective is to offer an AT&T job to any affected employee who qualifies and will relocate, if necessary. It has identified eight types of job openings likely to occur between 1992 and 1994 that may be of interest to operators.

Those not placed will be offered company-paid retraining opportunities, job counseling, outplacement services, and severance of up to 104 weeks pay, depending on seniority.

Voice-recognition technology will handle many long-distance calls now completed by operators--for example, collect and billed-to-third-party. The caller dials "0" and the number he or she wants to reach, and is prompted to say a particular word-- "collect," for instance. The call goes through, and a recorded voice asks the person called to say "yes" if he or she accepts the charges.

The customer who requires additional assistance, or prefers to speak with an operator, can always reach one by saying "operator." In addition, if the customer experiences any difficulties with a call, an operator comes on the line automatically.

Voice recognition is the latest in a series of improvements to increase operator productivity and speed call handling. In 1951, for example, AT&T introduced direct-dialing of long- distance calls.

Beginning in 1982, automated calling-card service let customers place card calls without operator assistance. In 1989, the company implemented an all-digital technology that put more customer information at operators' fingertips and enabled them to handle calls faster.

Voice-recognition technology will be deployed in Jacksonville, Fla., and Seattle, Wash., in June, 1992. Nationwide implementation will be completed in early 1994, AT&T said.

VOICE RECOGNITION: THE TECHNOLOGY

AT&T's announcement today of voice-recognition technology to automate many long-distance calls now handled by operators places the company at the forefront of this technology's development and deployment. This technology is the product of years of research at AT&T Bell Laboratories.

Teaching a computer to recognize and respond to the human voice is not easy. This is because the computer must be trained in a highly structured, artificial way to do what comes naturally and easily to a child.

For a computer to understand the word "hello," for instance, it must make millions of computations. It must then do additional processing to select the proper response to that word from its data base.

It is one thing to teach a computer to recognize one or two speakers through a high-quality microphone. It is another matter entirely to make voice-recognition technology universally useful so that it can respond to anyone--for example, a person making a long-distance call using a telephone handset.

This universal application is precisely what AT&T has announced today.

It is similar to the technology customers of AT&T's Conversant(R) Voice Information System already use to speed credit-card transactions, check bank balances, and place catalog orders, among other capabilities.

After decades of steady progress, voice-recognition technology has recently surged ahead because of major advances in algorithm development and digital signal processor technology.

A major hurdle in voice recognition was overcome with the development of word-spotting, a technology that focuses on recognizing a set of key words in conversational speech.

In a 1985 trial, customers were asked to speak one of several words typically used with an operator--"collect," "person-to-person," etc. Like most people, the speakers added extra words ("I want to make a collect call, please") that went beyond the system's limited vocabulary.

This led to AT&T's development of a word-spotting algorithm that only responds to the key words, while filtering out the rest. (An algorithm, like a recipe, is a detailed procedure for accomplishing a given task.)

This capability will be state-of-the-art until we have systems that fully understand the nuances of language. These systems will not be deployed on a large scale until about the year 2000.

Accompanying word-spotting were advances in digital signal processors (DSPs). AT&T is a leader in DSP technology, with powerful chips that dramatically increase a computer's computational capabilities and make a complex technology like word-spotting viable in the marketplace.

Voice-recognition reaffirms AT&T's commitment to be the world's best at bringing people together--giving them easy access to each other and to the information and services they want-- anytime, anywhere.

IMPLEMENTING VOICE-RECOGNITION TECHNOLOGY AT&T'S HUMAN RESOURCES PLAN

AT&T has developed a detailed human resources plan to ensure that every employee whose job is displaced gets every opportunity to find productive and challenging work.

The first element of the plan is today's announcement. All over the country, AT&T supervisors are conducting discussions with employees about voice-recognition technology and what it means for their work locations.

Supervisors are reinforcing the company's objective to offer an AT&T job to any affected employee who qualifies and will relocate, if necessary.

The company has identified eight types of job openings likely to occur between 1992 and 1994 that may be of interest to operators: o Operator services offices that will not be closed; o International operator services; o Telephone relay service centers, which provide telecommunications services to speech-and hearing-impaired customers; o Bilingual centers, which provide operator assistance to customers who do not speak English; o 800 directory assistance, which helps customers locate the growing

variety of toll-free 800 numbers; o Conference services, which provide operator assistance to customers making conference calls; o Telemarketing; and o Consumer operations centers, which help customers with billing and service inquiries.

The 31 operator services offices scheduled to close by the end of 1994 were selected, in part, based on their proximity to other offices where one or more of the eight types of openings will be located. This may make it possible for an employee who qualifies to find a new position within commuting distance of his or her home.

When an employee does not qualify for jobs within the immediate geographical area, but does qualify for positions outside of it, AT&T will provide relocation assistance if the person accepts a job.

AT&T takes seriously its responsibility to all employees, including those it cannot place in company jobs. To these people we will provide company-paid retraining opportunities so they can find challenging jobs outside AT&T.

Working with the CWA (Communications Workers of America) and the IBEW (International Brotherhood of Electrical Workers), we will deploy the resources of the Alliance for Employee Growth and Development, Inc., a labor/management partnership created in 1986 to provide programs to promote the long-term employability of AT&T people, inside or outside the company. Through the Alliance, employees have already taken thousands of hours of new-skills development programs.

In addition, AT&T will offer job counseling, outplacement services, and severance of up to 104 weeks pay, depending on seniority.

AT&T OPERATOR SERVICES OFFICES TO BE CLOSED BY 1994 Alabama Birmingham California Anaheim; Burbank; City of Commerce; Redwood

City; Santa Rosa Colorado Lakewood Florida Pensacola; Orlando; Miami (Westchester) Georgia Smyrna Illinois Collinsville Iowa Davenport; Des Moines Louisiana Shreveport Maryland Glen Burnie (closed 12/31/91) Massachusetts Middleboro (closing announced); Springfield Michigan Grand Rapids; Lansing Missouri Kansas City (one office) Montana Billings New Jersey Howell (closed 12/31/91) New York Brookhaven; Syracuse (closing announced) North Carolina Charlotte Ohio Youngstown Pennsylvania Pittsburgh Tennessee Alcoa Texas Dallas Washington Tacoma

KEYWORDS:

[[AT&T Home Page](#) | [AT&T News Online](#) | [Monthly Index](#) | [Search Press Releases](#)]

AT&T Media Relations Section Editor / Rita Ullrich

AT&T Media Relations Section Development / Brian Larkins

Reach Out and Pronounce This

WHAT AT&T IS DOING WITH ITS VOICE-RECOGNITION TECHNOLOGY

Your telephone may be listening to you—without human assistance. After extensive test marketing, AT&T has begun installing voice-recognition-based services throughout the country to take the place of some formerly operator-assisted tasks like credit card and collect calling.

Thanks to a recently developed technology termed "word spotting," AT&T can use an algorithm that ignores all but the target word or phrase. "I'd like to make a collect call" contains the keyword "collect," which is all the system needs to kick into collect-call mode. The system then asks for the caller's name and reproduces it in yet another recorded message, this time asking for acceptance of the call and charges. "Yes" or "no" or one of a few simple synonyms is obtained in the final transaction before the automatic operator rings off.

The system is called the BT-100, and it's made up of a tree architecture containing 16 to 28 processors, based on AT&T's Digital Signal Processing (DSP) 32 chip. AT&T is also taking a form of this technology into voice-recognition-based security systems, allowing credit and ATM card manufacturers to dispense with the easy-to-read magnetic

stripe and substitute an embedded microchip trained to recognize only a particular voice. Yes: You saw it predicted in "2001: A Space Odyssey," and you saw it again last year in the movie "Sneakers."

Earlier this year, NYNEX announced a new service called Voice Dialing, which will allow each user to create a speed-dial database that's activated simply by saying a name. And each database is intended to be customized for a particular voice; therefore, your request to "call Mom" won't ring the phone in my mother's house.

The technology has been in the works for six years. Subscribers build a database by training the system with several different pronunciations of the target name. The system digitizes the sound and accompanying phone number, using 22 different parameters to recognize each piece of information, among them intonation, pitch, and tempo.

Being so voice-specific, it will require kids to update their directories with each significant change of vocal timbre, but one enterprising youth in a test market got around that problem by simply teaching his Voice Dialing database to recognize the woof of his barking dog.

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Appendix F

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HEADLINE: AT&T to Phase Out Jobs in Long Distance Units

DATELINE: BASKING RIDGE, N.J.

BODY: AT&T announced plans today to phase out 14,000 to 15,000 jobs in its communications units over the next two years to streamline operations and reduce its costs in the highly competitive long distance business. When completed, the phaseout is expected to save the company at least \$ 900 million a year as new technology is deployed and management layers are reduced. Service to customers will not be affected by the reductions, AT&T said. More than half of the job cuts will be in management. Affected employees will be offered a variety of payments if they leave the company, including up to 104 weeks' wages for nonmanagement workers and up to 42 weeks' salary for managers. The reductions will come in the company's Communications Services Group, which has 96,500 people and provides global long distance services to businesses and consumers. Some 8,000 to 9,000 positions will be phased out in Consumer Communications Services. As part of this action, the unit will consolidate certain sales and service operations that will result in the closing of centers in Providence, R.I.; Charleston, W.Va.; Bloomington, Minn.; Cheyenne, Wyo.; Itasca, Ill.; Pleasanton, Calif., and Silver Spring, Md. The Business Communications Services unit will phase out about 6,000 jobs. Overall, about 8,000 management jobs will be affected, including headquarters staff and administrative support functions, while the rest will be nonmanagement positions in operations and clerical areas. The company said it will begin notifying work groups affected by the reductions by the end of the month, and will begin notifying individual employees by the end of March. As with previous job reductions, AT&T will provide a variety of assistance, ranging from job counseling to retraining, in an effort to find jobs for people either within AT&T or at other companies. In some areas of the country, AT&T will also run ads to help place employees, using job hotlines and a computerized system to match skills with opportunities.

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