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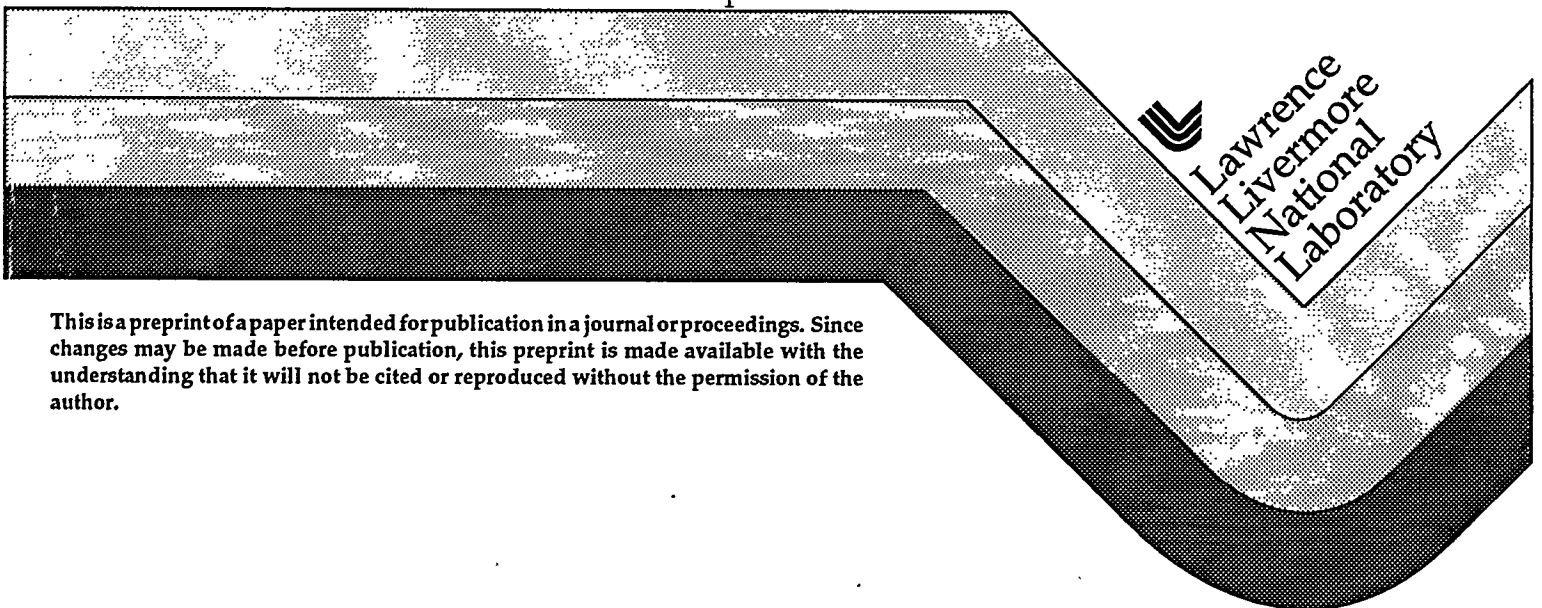
# Government Services Information Infrastructure Management

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## **GOVERNMENT SERVICES INFORMATION INFRASTRUCTURE MANAGEMENT**

This paper was commissioned by the Government Information Technology Services (GITS) subcommittee of the Committee on Applications and Technology of the Information Infrastructure Task Force. It was drafted for the GITS by John S. Cavallini and Robert J. Aiken of the Department of Energy. It was reviewed and endorsed for submission to the NII 2000 Symposium by the GITS membership.

### Abstract:

The Government Services Information Infrastructure (GSII) is that portion of the NII used to link Government and its services, enables virtual agency concepts, protects privacy, and supports emergency preparedness needs. The GSII is comprised of the supporting telecommunications technologies, network and information services infrastructure and the applications that use these. The growth and deployment of the GSII, and its relationship with respect to the National Information Infrastructure (NII), will require the Federal Government to drastically change the way it acquires and deploys telecommunications for support of the Government's businesses. The GSII is an enlightened attempt by the Clinton/Gore Administration to form a virtual government crossing agency boundaries to interoperate more closely with industry and with the public, as well as state and local government, to greatly improve the delivery of government services. The GSII will have to be an integral component of the NII in order to do so. The GSII, and other private sector efforts, will have a significant impact on the design, development, and deployment of the NII, even if only through the procurement of such services. The Federal Government must adopt new mechanisms and new paradigms for the management of the GSII, including improved acquisition and operation of GSII components in order to maximize taxpayer benefits, to optimize the delivery of government services, to ensure that the GSII is an integral component

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of the NII; and to adopt industry standards rather than setting them. Government requirements and applications, as well as the available technologies to address those requirements, will continue to evolve; therefore so must the Governments use of technologies and services. The requirements from Federal government services and the users of these services logically form affinity groups that more accurately and effectively define these common requirements, that drive the adoption and use of industry standards, and that provide a significant technology marketplace to capture the vision of the NII both now and the future. It is critically important that the Federal Government adopt a management scheme that improves its ability to work with U. S. industry to ride the coming Third Wave<sup>13</sup> as opposed to being wiped out by it. This paper discusses new management schemes and new paradigms for interaction between Government and the private sector which must be developed and employed to improve cooperation between the Government and private sector and to improve the chances for a successful evolutionary deployment of both the GSII and NII.

Background:

Today, the private sector is developing and deploying information infrastructure. At the same time, the government is concurrently developing and deploying information infrastructure, mostly through contracts with the private sector. Under the lead of and at the encouragement of the Clinton/Gore Administration, the Federal Government has placed increased emphasis on the development and deployment of a National Information

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Infrastructure (NII) as a strategic priority. This emphasis results from the understanding that properly leveraged information and information technology are among the nation's most critical economic resources, for manufacturing industries as well as for more modern services industries for economic security and for national security.

The Clinton/Gore Administration has made a commitment to work with business, labor, academia, public interest groups, Congress, and both state and local government to ensure the development of an NII that enables all Americans to access information and communicate with each other using combinations of voice, data, images, or video at anytime, anywhere.<sup>1</sup> This commitment was articulated very well by the National Performance Review (NPR) through its emphasis on using information technology as a key element in creating a government that works better and costs less.<sup>2</sup> The President and Vice President recognize the need to use information technology to improve American's quality of life and reinvigorate the economy. To this end, they outlined a three part agenda for spreading information technology's benefits to the Federal Government: (1) Strengthen Leadership in Information Technology, (2) Implement Electronic Government, (3) Establish Support Mechanisms for Electronic Government. Thirteen major Information Technology (IT) areas were identified for accomplishing the three part agenda:

- 1) Provide Clear, Strong Leadership to Integrate Information Technology into the Business of Government,
- 2) Implement Nationwide, Integrated Electronic Benefit Transfer,
- 3) Develop Integrated Electronic Access to Government Information and Services,
- 4) Establish a National law Enforcement/Public Safety Network,
- 5) Provide InterGovernmental Tax Filing, Reporting , and Payments Processing,
- 6) Establish International Trade Data System,
- 7) Create a National

Environmental Data Index, 8) Plan, Demonstrate, and Provide Governmentwide Electronic Mail, 9) Improve Government's Information Infrastructure, 10) Develop Systems and mechanisms to Ensure Privacy and Security, 11) Improve Methods of Information Technology Acquisition, 12) Provide Incentives for Innovation, and 13) Provide Training and Technical Assistance in Information Technology to Federal Employees.

Development of an NII is not an end goal in or of itself. Government requires an infrastructure to conduct its business more effectively and to deliver services to the American citizenry at lower cost to the taxpayers. A number of suitable national scale applications or uses of the NII have been identified and documented by the Information Infrastructure Task Force (IITF)'s Committee on Applications and Technology (CAT).<sup>3,4</sup> These uses of the NII, in addition to nationwide humanistic applications such as health care and education, include the fundamental businesses or enterprises of the Federal Government such as law enforcement, electronic commerce (including benefits), basic research, environment, health care, and national security, and as such represent a significant set of driving requirements for NII deployment.

In recognizing this fact, the NPR concluded that the government use of information technology and development of information infrastructure should be improved and better coordinated in order to effectively address government business requirements. The NPR made approximately 60 recommendations for action in this regard, including the development of a plan for a Government Services Information Infrastructure (GSII) to electronically deliver government services and to integrate electronic access to government provided information and services. It was also recognized that better integration and coordination was required not

only across Federal Government agencies, but also across federal and state governments, local and tribal governments, to the private sector, and to the public at large.

To achieve these goals, The Vice President established the Government Information Technology and Services (GITS) working group in December of 1993. The mission of the GITS working group is to promote the improvement of agency performance through the use of information technology, accelerate the deployment of advanced networking technologies, and in conjunction with the Office of Management and Budget (OMB) and General Services Administration (GSA), establish procurement and implementation policies, practices, and directives designed to improve productivity and reduce costs. The working group's responsibilities include implementing the National Performance Review's recommendations, coordinating federal agency and White House initiatives for evolving the NII, and enhancing cross agency Information Technology (IT) collaborations as well as government and industry IT activities.

The GSII: Analysis:

The attributes of an effective GSII must include timely infusion of appropriate IT to meet requirements; coordination of infrastructure across government requirements and with the private sector; effectiveness while allowing for innovation and flexibility to meet specific needs; information surety to guard citizens rights and privacy while also providing for national security needs; cost effectiveness of Information Technology (IT) acquisition and development while also encouraging a competitive technological environment; ubiquitous

accessibility to all citizens including those with disabilities; ease of use for locating government information or for service delivery; transparent (to the user) integration of the GSII portion of the NII with the rest of the Internet, NII, and the Global Information Infrastructure; shared resource use across government entities; and the mechanisms, processes, and procedures to appropriately manage such a diverse infrastructure.

Information infrastructure is more often currently viewed, versus the Open System Interconnect (OSI) seven layer model, as having three or four layers.<sup>5</sup> A recent report of the National Research Council ('Realizing the Information Future') proposes a standard open bearer service to promote, and perhaps maximize, interoperability across the NII. This is a significant feature which the GSII must adopt and integrate as it evolves. Nevertheless, merely focusing on the NII layer concept, and other technical models, can lead one to neglect two of the most important components of the GSII and the NII. They are people, both using and providing services over the NII; and the coordination mechanisms needed to effectively manage the total GSII activities and efforts.

Standards are often cited as the only way to achieve interoperability across the NII or GSII. However, standards can often be too much of a good thing.<sup>6</sup> The technology life cycle averages twelve to eighteen months with new hardware and software being introduced at a dizzying pace. The current standards processes have not been able to keep up. Competition among many vendors is crucial for reducing cost as well as ensuring a viable technological gene pool for both current and future requirements. Innovation requires new concepts. Flexibility is required to meet a wide and diverse set of special requirements and can enable the incremental evolution of the GSII and NII in a stepwise manner. Today's infrastructure

has an enormous amount of different components comprised of various technologies and standards. Therefore, a seamless integration and evolution of the multi-component GSII into the evolving NII will need to be based primarily on voluntary processes and proven interoperability solutions rather than on mandated standards. These and many more facts lead us to the conclusion that standards alone are not sufficient. Furthermore, although the Internet protocol suite was originally developed as a military specification it was not adopted as a Federal procurement standard or an industry standard and, yet, through versatility and capability to meet the research community's requirements, while supporting a productive range of interoperability, the Internet Transmission Control Protocol (TCP)/Internet Protocol (IP) became the most widely used internetworking protocol. Therefore, common requirements will provide the best gauge of the range of interoperability needed as well as the best technical solution(s).

Current Federal coordination mechanisms are a result of the "Brooks ADP Act" of 1965 which was passed in an era characterized by mainframe computers when timeshared processing was the primary technique for managing scarce information technology resources. Reflecting the centralized technology, the decisional and oversight responsibility for planning, acquiring and managing information technology was taken from the heads of the various Executive agencies and vested in the Administrator for General Services. The theory was that investments in information technology must be centrally managed, and that only a dedicated cadre of information technology professionals could perform the function.

Over the years, the original model eroded and technology became decentralized. Today, agencies plan and manage their own information technology investments, with the

General Services Administration's (GSA) procurement authority being "delegated" to the agency heads. As a condition of the delegation, agencies are subject to some acquisition and management oversight by GSA. That oversight, however, is generally of a cursory nature since the GSA can today have neither the institutional expertise nor the resources to adequately understand, let alone manage, the government's increasingly decentralized and diverse information technology infrastructure. Ultimately, the centralized control model of the Brooks Act, which reduced both the responsibility and the authority of the heads of Federal agencies, contributed to significant failures in IT management and seriously misspent resources.

The old centralized approach could achieve interoperability neither across the government infrastructure, nor with the private sector, and was even counter productive in efforts to do so. In the future, an NII will undoubtedly incorporate multiple paradigms of internetworking, interoperability, and communications, thus making the task of coordination and interoperability even more difficult. Logically then, the question is how to promote interoperability. We propose starting with what the GSII will be used for - the business functions which can be considered GSII applications - and with those people who share common interests in both using and providing the GSII. The applications should determine what standards and technologies are required and will provide interoperability among their own constituency as well as with other groups, if properly coordinated.

#### Applications and Affinity Groups:

Government services and uses of the NII for law enforcement, benefits, and health

care touch every community. Those for research, environment, and national security go beyond local geographic requirements to requiring leading edge IT capabilities for the NII. Hence, government applications provide significant financial leverage and incentive for NII deployment and as well as for IT development. If one were to add applications for education, generic electronic commerce, and energy delivery and management to this set of Federal NII applications, the cost leveraging for deploying the NII becomes significant.<sup>7</sup> For example, in energy, "Electric Utilities already serve over 95 percent of American homes (a percentage point above telephone companies.)"<sup>7</sup> with the "likely requirement that all these homes will need access to advanced telecommunications to manage energy..."<sup>7</sup> consumption. It is unlikely that telecommunications for energy demand management will replace conventional access mechanisms, especially the last mile to residences; however, the energy utilities telecommunications infrastructure can augment, leverage, and enhance the cable and telecommunications industry infrastructure and facilitate access to the NII and hence GSII for almost all Americans, including remote rural areas. In addition to the impact the energy utilities may have on the NII, FTS2000 and its successor will have a more direct impact on both the NII and GSII since it will be a major vehicle for supplying telecommunications and services to the Federal Government. Today's FTS2000 "currently provides intercity telecommunications for 1.7 million federal government users"<sup>15</sup>. Post-FTS2000 is expected to go beyond the current FTS2000 by delivering intercity telecommunications as well as value added services such as electronic mail, key management, teleconferencing, and more. This deployment will be an integral component of the GSII and will use industry provided services almost exclusively, thereby leveraging the products of

industry rather than competing with them. However, this reliance on and use of industry products and services will not lessen the impact that the federal government, via procurement vehicles, will have on the NII and GSII; therefore, the proper coordination of the deployment and management of the GSII with respect to the NII is even more critical.

This paper concentrates on achieving an effective GSII, which will require creating a methodology for managing evolving IT policies, priorities, and programs that provide and coordinate the framework within which the mission, as well as the administrative, IT requirements and activities of individual Federal departments and agencies are conducted. The principal focus of the current top level IT management is on what today are perceived as the common goals -- mainly the administrative requirements for finance, personnel, facilities, etc. -- of the overall enterprise called the Federal Government. Implementation of a new enterprise model, one that is driven by other mission applications as well that represent government services to its customers and their requirements, is essential to making the government work better and cost less.

The Federal Internetworking Requirements Panel, created by the National Institutes for Standards and Technology at the request of DOE's Office of Scientific Computing and the High Performance Computing and Communications (HPCC) community, issued a report<sup>8</sup> which recommends increased responsibility for this shared infrastructure, such as a GSII, for the mission areas of Federal agencies or their logical affinity groups in as compatible a way as practicable with the common vision of the Federal government. The term affinity group means government agencies, or functional interest groups therein, that share information electronically and have common IT requirements. The NPR had emphasized the need for

improved infrastructure for cross agency groups. In addition, the FIRP report recommended the development of affinity groups to enhance cross agency collaborations. Taken together, these factors make it reasonable to require that each agency explicitly ensure that GSIH issues, including interoperability, are addressed not only within a given Federal agency, but also with external affinity groups, industry, and the public, in which these agency mission or 'enterprise' areas take place.

The Federal research community is an excellent example of an affinity group. During the past decade, the Federal research community has placed a very high priority on the application of advanced information technologies to enable advancements in many science disciplines. As experimentation becomes too expensive, too unsafe, or too environmentally unsound, the importance and value of computational experiments, collaborative virtual reality, distributed computing infrastructure technologies for remote access to "one of a kind" facilities, for shared data, and for dispersed collaborations has increased. Correspondingly, a sound and capable NII is needed since the research community crosses many organizational boundaries, large geographical distances, and multiple capability needs. By virtue of its use of advanced capabilities, the research community or affinity group has mobilized to coordinate their requirements and to cooperate in their solution.

Interagency, cooperative activities in the mid-1980's, prior to the start of the HPCC program, included studies to examine the need for common infrastructure. These studies resulted in the development of the National Research and Education Network (NREN)<sup>9</sup> component of the HPCC initiative which proposed, and subsequently implemented, Internet technologies to support the internetworking needs of the research programs of the Federal

agencies. In one notable case, the Energy Sciences Network extended these common affinity group requirements to include other administrative requirements by implementing a multi-protocol network, installing gateways for multiple e-mail systems, etc. These studies drew upon the expertise and the involvement of many academic and industrial researchers as well as organizations external to the Federal agencies, constituting a large affinity group and adding a large user base to the Internet and establishing its technologies as a viable and productive technology paradigm.

This success notwithstanding, the research community of each agency also needs to interact electronically with other parts of its own agency (e.g., ESnet solutions for administration and Information resource management), which are not normally a part of the research affinity group, as well as with their affinity group colleagues. These requirements of the research community did not always converge within the group (although it was generally discussed and studied), however, convergence (and ultimately interoperability), was even more problematic outside of the research community.

Affinity groups do, however, represent a very powerful method for identifying common requirements, coordinating infrastructure needs, promoting and maximizing interoperability of applications and services across agency boundaries as well as with industry and the private sector, evaluating new technologies, eliminating unwarranted redundancies, interacting with various affinity subgroups or working groups, and sharing data, information, and knowledge about their enterprise or business area and how IT promotes effectiveness. This results in application driven standardization for supporting important common functions, priority setting for new tasks, understanding of minimum capabilities needed to perform

common business functions, and overall coordination for multi-organizational, distributed enterprises; attributes which are needed to maximize coordination for multi-agency, distributed government services in the information future in the GSII.

Optimizing GSII and NH Compatibility:

Federal IT management reform is needed to correct the current problems with regard to managing IT in the Federal Government to achieve a management scheme that works better. A new management scheme should set up mechanisms to aid agencies in carrying out their responsibilities, to evaluate agency IT investments via performance measures of programmatic results and products, and to promote both compatibility and interoperability across recognized affinity groups. We propose the establishment of a high level 'Leadership Council,' which brings together recognized leaders of larger or more critical mission driven affinity groups as well as government and private sector IT services providers to:

- a.) promote cooperation among agencies by empowering lead agencies to conduct multi-agency procurements, by coordinating across affinity groups, and by seeking opportunities for consolidation and cooperation, where appropriate;
- b.) set strategic direction and priorities for common infrastructure services and to identify lead or executive agencies, when appropriate, for procuring or providing common services;
- c.) oversee a government-wide IT innovation fund;
- d.) evaluate the work of agency activities through 'independent' or external technology review panels or committees; and

- e.) make policy recommendations to OMB to improve overall GSII effectiveness and to enhance coordinations, such as changes to the Federal Advisory Committee Act to increase private sector involvement in GSII planning and decision making.

It should be noted that administrative functions for personnel, finance, procurements, facilities management, etc. logically combine the traditional Federal IRM organizations together into an affinity group. One could conclude that this grouping results in a federal government affinity group based on electronic commerce. Individual agencies would still require policy and oversight function for IRM or IT management activities, however, it is not envisioned that multiple large centralized IRM organizations would or could promote GSII interoperability goals (e.g., large redundant organizations in the General Services Administration and the agencies), or adequately serve the GSII goals and objectives well into the information future.

GSII Plan:

Promoting interoperability, coordination, and information exchange across agencies and affinity groups is of paramount importance for achieving the goals of the NII and for creating an evolving and successful GSII. The best means of achieving this goal is through the use of the very same IT which will make the GSII successful; in other words, use the technologies that we advocate for all agencies' businesses to further enhance the management and oversight of the GSII. As an example, a very important IT for furthering this goal is the use of World Wide Web (WWW) technology, which is a product of both the Federal and International High

Energy Physics and also the High Performance Computing and Communications research communities.

The Government Information Technology Services (GITS) working group<sup>10</sup> has endorsed the use of the WWW to create and maintain a 'living' and 'evolving' document accessible to all over the net. The GITS WG has the responsibility for implementing the NPR IT recommendations,<sup>11</sup> one of which is to develop a GSII Plan. Understanding the changing nature and the wide variety of GSII components, elements, and layers, the GITS decided to create a collaborative, on-line document on the WWW.<sup>12</sup> The Plan consists of summarized reports of various affinity groups, agencies, panels, committees, etc. presenting the most current thinking with regard to GSII technology direction, issues, applications and management. It allows for interactive feedback and comment. All contributions will be referred to a GITS subgroup and/or be addressed by other expert groups.

On-line implementation plans, updates, and dialog for the GSII, as well as its committees, activities, documents and plans, will help to promote common understanding of issues and status as well as to establish the foundation for the discussion of new ideas and/or requirements by government, industry, and the public on both a national and international basis.

#### Federal vs. Non-Federal Issues for the GSII:

Some issues which need to be resolved for the deployment of the NII result from the differences between Federal policies, regulations and practices versus those in the private sector. It is timely now that the Congress and the Administration are committed to

telecommunications reform, as this will help lay the foundation for resolving some of the GSII versus NII issues in the future.

Key issues that need to be addressed for successful GSII and NII integration include procurement reform, key and certificate management infrastructure, electronic signature, intellectual property, common carrier status and open access for the network and information service providers, standards setting, and cost recovery for shared infrastructures.

Recommendations:

First, Federal IT management reform is needed to deal with Third Wave,<sup>13</sup> i.e., truly information age, organizations and business so that the Federal Government can, in fact, achieve its NPR goal of creating a government that works better and costs less.<sup>14</sup>

Second, the necessary features and mechanisms for achieving a successful GSII should, at a minimum, include:

- a.) Federal agency flexibility to meet mission requirements in a cost-effective manner;
- b.) Accountability based on technical success leading to programmatic outcomes and enforced through the budget process;
- c.) Support "easy to use" mechanisms for interagency sharing of services and operations, including franchising, cross-servicing, and multiple agency contracts;
- d.) Provide services/infrastructure as required by communities of interest, i.e., affinity groups for government business areas, by agencies, and by their

customers;

- e.) Standards selected by affinity groups with technical assistance and possible facilitation by lead agency or by the GITS working group;
- f.) Interagency fund for innovative IT programs;
- g.) A ready source of expert, objective advice for complex system acquisitions;
- h.) Central collection of information, as needed, to support government-wide priority setting, information sharing, cross agency and cross affinity group coordination, and infrastructure investment optimization; and
- I.) A fast, equitable way of handling contract disputes

Third, improvement in government and private sector cooperation (e.g., via extended affinity groups) is required to achieve: a more timely acquisitions process; a more responsive standards process; open access interoperability between NII and GSII services providers; and revising the Federal Advisory Committee Act (FACA) to provide relief for some activities with regard to the GSII and NII to encourage rather than to discourage such cooperation. The FACA can often discourage government activities from utilizing academia, industry, and other private sector organizations in developing priorities and goals for designing and implementing the GSII and ensuring that the GSII is an integral component of the NII.

Lastly, continued dialog on the direction of development and deployment of the GSII, especially relative to its superset - the NII, via the WWW implementation of the GSII Plan is needed to ensure convergence of these two very important national resources and to achieve

the optimum 'range of interoperability' that one could expect from such a complex and diverse infrastructure.

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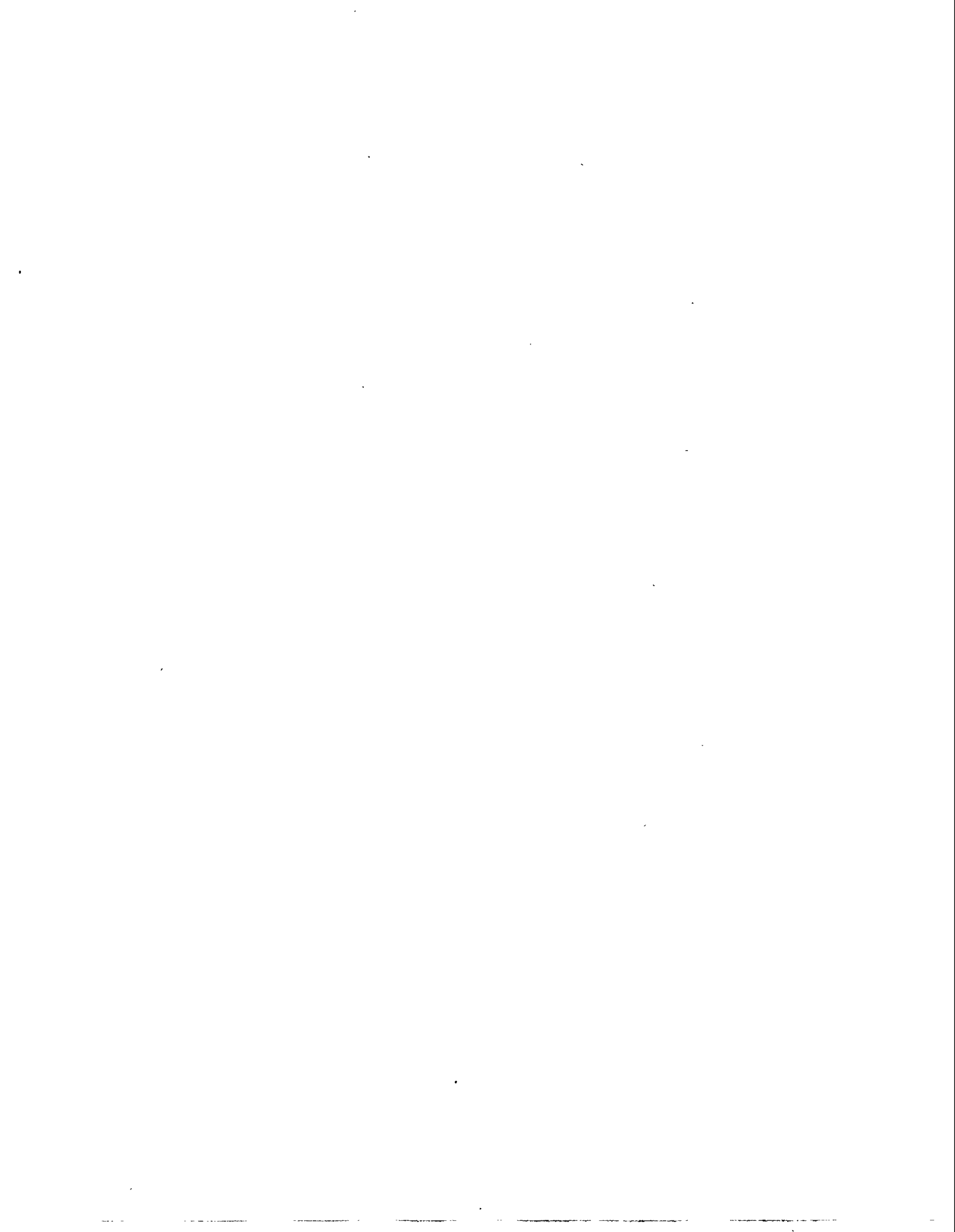
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