

## The ERROS Connectionist Database



### An Innovative, Productive, Simple to Use, Alternative to The Intransigent Programming Paradigm

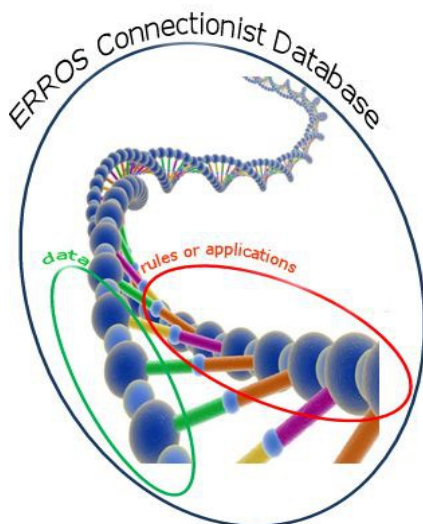
Since the beginning of the computer industry, computer applications have been built using computer programs. These contain the rules and a database stores the data to which the rules apply. These separate worlds of data and programs have to be kept in synchronisation, at best a fragile process. This separatism – the splitting of the data from the rules – is responsible for most of the ills of the computer industry.

Making even simple changes to a traditional, separatist system can be a problem. Adding an extra field to an existing file may seem straight forward, yet implementing such a change can be quite challenging. This is because of the architecture of traditional applications with their rigid database systems and computer programs which are not amenable to change.

Traditional application creation always depends on computer programs, created by programmers or generated by a computer. Program coding is a very slow process and program languages are not understood by users, so, until a system is ready for final testing, they cannot be sure that it will meet their needs. If they then request what they consider to be minor changes, these may not be easy to implement.

Much energy has been expended in trying to speed up the program creation process, but it seems that few people have stood back and wondered whether programming is the only way. The most efficient data storage and retrieval system that we know is the human brain. This can absorb new concepts with ease and, unlike computer systems, it is not shut down, redesigned, reprogrammed, tested and restarted to accommodate even the simplest change. If this were the way that our brains worked, we would know nothing. It seems that the brain's astonishing capabilities are dependent on its accumulated knowledge, and its ability to navigate the connections between individual pieces of data. It is clearly data driven and it probably does not make much distinction between the rules, which we might call metadata, and the data to which those rules apply – in computer terms, the user data.

We can follow the brain and replace program code with records in a database. We can store all data and application definitions and user data in the ERROS Connectionist Database, a unique, open-ended, totally flexible, database management system that is based on Artificial Intelligence or cognitive techniques. A relatively small program kernel, the ERROS database handler, interprets the definitions and accesses and updates all metadata and all user data for all ERROS applications. These include the ERROS Business Modeller, the ERROS Application Creator and the ERROS Authority Organiser. The ERROS Connectionist Database is a NoSQL database. Sophisticated automatic indexing means that it is also a fully navigable semantic network in which all data is stored in its context.



In ERROS, the data and application definitions are created using ERROS's Open Application Architecture, employing object-oriented techniques that allow reuse of all data definitions. These are stored together with menus, procedures, application and security definitions and the user data in the ERROS Connectionist Database. Screen and printer layouts are also defined in the database.

The ERROS Connectionist Database might be compared to the structure of the DNA string in which both sides are related but independent and are interconnected to form one whole. In ERROS, the data and application definitions and the user data are integrated and always synchronised.

ERROS entity type, attribute and application definitions are stored as connections, defined in the user's natural language (English, French, German etc.), rather than in a programming language that only computer specialists can understand. When new entity types, attributes or applications are defined, no new files are created and no program changes are normally required. Metadata and user data, with little distinction between them, are stored in the ERROS Connectionist Database in a Universal Data Type and are updated and retrieved using the ERROS database handler. The ERROS Connectionist Database is defined in itself, using the same structure as for all other definitions.

Most attribute values – the user data – are also stored as connections. All connections are bidirectional and users can access any data to which they are authorised by navigating these in either direction at the same very high speed, allowing them to find connections that they did not know existed. No joins and no query language are required. ERROS applications turn raw data into a semantic knowledge base. Like the brain, ERROS applications are data driven.

The ERROS Connectionist Database can combine very complex multidimensional, relational and network data structures with limitless levels of hierarchy. The ERROS Connectionist Database can handle totally variable length data without Null values or wasted space.

ERROS allows genuinely incremental development of complex systems, without a detailed upfront user or system specification and without detailed physical file design. Application development is largely self documenting and changes can be rolled back. Changes to the database structure and the applications can be made whilst the system is live, without impacting the performance of other users on line at the time. All ERROS applications are developed and can be operated over the Internet using the ERROS Standard Operator Interface (SOI) which dynamically generates HTML and JavaScript to provide a Graphical User Interface for PCs, Macs, tablets or smartphones. Developers do not require HTML skills. The GUI adapts immediately to accommodate any changes. SOI also generates PCL5 for printing.

ERROS is a totally new way of creating major computer applications. Application development and maintenance are dramatically simpler than with traditional methods and have a short learning curve. ERROS is extraordinarily productive. ERROS applications, that can be changed on demand, are developed –

- incrementally - you can 'grow-as-you-go',
- without a detailed user or system specification,
- without physical database design (i.e. no normalisation),
- without any new file creation,
- mostly without program creation or change,
- with considerably reduced development, maintenance and operational costs,
- and operated using a browser over the Internet.

There are no compiled ERROS applications and the concept of compiled, intransigent applications has gone.

ERROS solves with ease a variety of problems for which many developers and even database researchers do not have a generic solution, such as

- storing multiple record types in the same table,
- incremental development,
- bidirectional, many-to-many, relationships or connections,
- variable length records without Null values,
- repeating fields (by default),
- retaining history of updating,
- automatic indexing of attribute values within each entity.

ERROS allows entity types, individual entities, attribute definitions and individual attribute values or iterations to be referenced, stored and retrieved by name, and/or number and/or date (and time), without any regard to their physical location. An ERROS application developer does not need to design a physical database schema and indeed cannot do so. ERROS also allows multiple alternative record identifiers that can be used to retrieve records, perhaps where their name has changed.

ERROS can be used for creating major, web enabled, collaborative applications, with automatic concurrency control, for a very wide variety of businesses, including transaction processing, and for the humanities, for cataloguing, collections management, archiving, recording history of any type, and for ontology and taxonomy. ERROS is very suitable for creating application packages, such as ERP, which can easily be modified to suit each user.

ERROS has been used to create STIPPLE, a major cataloguing and research system for the fine and applied arts and the humanities. This is a collaborative system that can be used by multiple institutions anywhere in the world to create catalogues raisonné and union catalogues of any type of object. STIPPLE has over two hundred separate entity types, each defined with multiple complex relationships. It has the potential to catalogue all the fine art of the Western world in one integrated system. Each object type has its own data schema. It can handle enormous volumes of data and images. STIPPLE can produce typeset printed catalogues, labels for exhibitions, etc., or output XML for transfer to a publishing package. All institutions can share biographical records, records in the gazetteer, bibliographic references etc., with much reduced research and data entry costs. STIPPLE integrates the data from all disciplines.

All ERROS applications -

- have exceptional, almost zero second, response times,
- are scalable - performance does not noticeably deteriorate as file sizes grow,
- are suitable for big data,
- are very robust,
- are always internet ready – no content management system is required,
- have outstanding security which can be at the field level,
- have an audit trail that applies to all data and application definitions and to user data,
- can be changed in line with the ever evolving world of the users,
- can have both 'public' and 'private' (i.e. user) data for co-operative applications,
- have a high availability option,
- are automatically integrated, sharing data without redundancy.

Computer hardware has changed beyond recognition in the last fifty years whilst underlying system development methods have not changed, although Graphical User Interfaces may make them appear different. Despite a variety of initiatives, such as Agile, system development still requires detailed file design and program creation using iterative processes. Unlike ERROS, these do not allow incremental development.

In ERROS, the separatism of traditional development methods has been replaced by the connectionism of the real world. The concepts of ERROS have been patented.

ERROS is a total paradigm shift in modern application development methods so cannot easily be compared with traditional development methods nor can it be described in a few sentences. It is not like any other product and any assumptions about how it works might be misleading. ERROS runs under the IBM i operating system on the IBM Power Systems platform and on its predecessors. For an insight into how ERROS works, visit [www.erros.co.uk](http://www.erros.co.uk).

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