



SHARING DATA WORLDWIDE WITH BIONUMERIC



All over the world, laboratories are facing a century of new challenges where communication and data exchange will play a major role. The need for exchange of phenotypic, genotypic, and fingerprint data is increasing in all bio-scientific branches. The success of interlaboratory collaborations and projects, particularly in epidemiological research, depends on fast and efficient data exchange. BioNumerics offers a revolutionary solution to this emerging issue with its integrated Database Sharing Tools and the new BioNumerics Server package, which allows a professional Client-Server setup to be established.

The internet highway

The enormous potential offered by the internet is taken advantage of in the BioNumerics software with its integrated Database Sharing Tools. The key component behind the exchange of data is the so-called *Bundle*. A Bundle is a packed file that contains a selection of BioNumerics database entries (e.g. bacterial strains), along with one or more experiments and information fields, as specified by the user.

Peer-to-peer data exchange

BioNumerics users having the Database Sharing Tools can exchange information at a peer-to-peer level. The database exchange tools in BioNumerics are very simple to use: the user who wants to send information makes a selection of database entries, and clicks the information fields and experiments to be contained in the bundle. Received bundles can be directly analyzed together with other database entries. BioNumerics automatically recognizes which experiments are compatible.

Client-Server solutions

Each BioNumerics and GelCompar II software package that contains the Database Sharing Tools comes as a client version, which possesses all functionality to connect and communicate with a BioNumerics Server. The BioNumerics Server runs in background below the user level while processing tasks and queries from client users. The Server provides two fundamentally different solutions for shar-

ing its databases and offering its services: a direct TCP/IP based connection and a web-based communication.

Solution 1: Direct TCP/IP connection. This solution provides a direct connection between the Server and the client which allows uploading and downloading complete database entries, interactive querying, and batch identification by the client (see Figure 1, upper part). The key components for this direct and powerful client-server communication are the Bundle concept and TCP/IP internet communication. The Server, which contains the BioNumerics reference database(s), runs BNSERVER, a Windows NT service which automatically performs identifications, answers queries, and maintains logfiles. The communication happens through TCP/IP, and bundles are the database information packages transferred. The Client is a BioNumerics or GelCompar II user possessing the Database Sharing Tools module. Once a Client has obtained permission from the Server to query a database, e.g. by entering a correct login and password, it can connect to the Server database and perform one or more of the following functions, according to permittance settings specified by the Server:

- Perform interactive searches on the Server database and download queries;
- Send data to an Incoming directory of the Server;
- Request the Server to perform remote identifications and receive back detailed reports with possibility to request full information and download.

Solution 2: Web-based communication. This solution requires Microsoft's Internet Information Server (IIS) at the Server site and an additional BioNumerics tool BNWWW, which is an ISAPI extension translating HTML requests into commands for BNSERVER (see Figure 1, lower part). The BioNumerics Webservice can be a separate computer, for example, placed outside the firewall. In this case, the Server becomes an HTTP-server and communication happens through HTML. The client only needs a web browser to submit fingerprints, profiles or sequences to the Server; the result is returned as an HTML page documented with identification reports, fingerprint images, and links for requesting detailed information about particular closest matches. If allowed by the Server, the client can download bundles from its web browser.

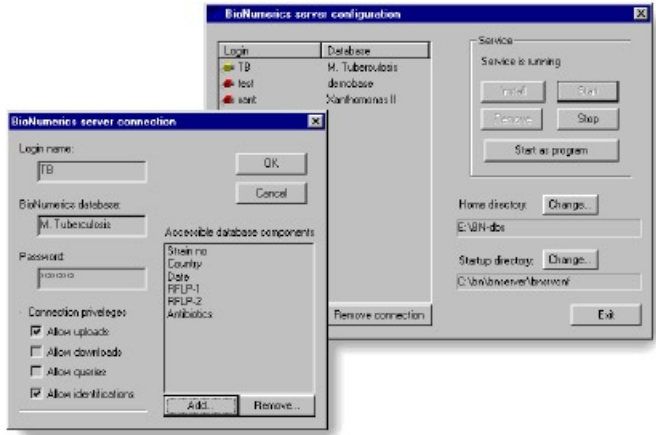


Figure 2. BioNumerics Server configuration window (back) and Client login, password and permission settings (front).

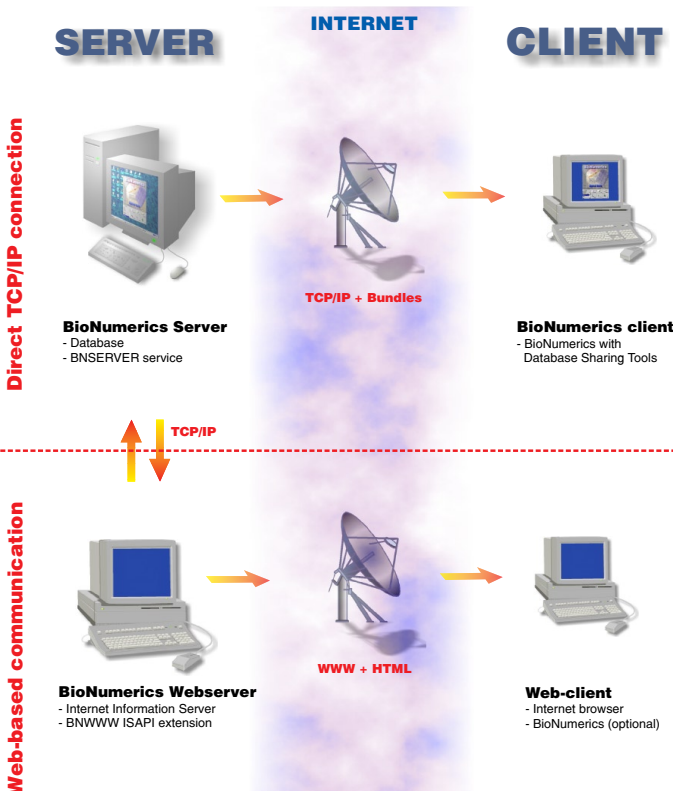


Figure 1. Schematic representation of the two possibilities for Client-Server exchange in BioNumerics.

Server features

The BioNumerics Server possesses the following main features:

- Fully automatic Windows NT service which runs in background and which is multi-threaded (multiple clients are processed simultaneously);
- Serving many databases at the same time; limited only by computer capacity;
- Full control over accessibility of every individual database component per Client;
- Login and password protection of databases; optional encryption of data in case of direct TCP/IP connection;
- Automatic transfer of queries from the server database as requested by a client;
- Automatic upload of data sent by a client ("Incoming" directory). In case of fingerprint patterns, optional upload of full database info including image file, to allow

re-editing at the Server site.

- Automatic identification of batches of entries sent by a client, and subsequent storage and return of detailed identification reports;
- Recording of detailed history files of all events with indication of login time and client's account;
- Automatic identification of experiments sent by a client using a web browser, and return of an identification report as HTML page.

Client features

BioNumerics and GelCompar II clients with the Database Sharing Tools module have the following features:

- Creation of bundles from any selection of entries from the database and containing any selection of experiments and information fields;
- Import of foreign bundles in own database with possibility to compatibilize experiments by renaming experiments or characters and using only common features;
- Easy connect to Server and upload of bundles or complete gel information files;
- Real-time identification and receipt of detailed identification report;
- Extensive functions for interactive Server querying;
- Download of queries from Server database and optional saving in local database.

For more information and prices of the BioNumerics Client-Server suite and the Database Sharing Tools, contact us, or visit our web-site.

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