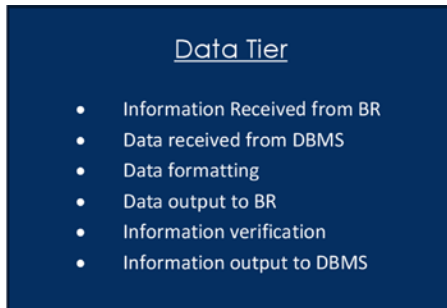# Data Tier

Figure 2-15. *Data tier*

The data tier's main function is to store information on a secondary device or to return data to the business rules tier. Data can (and usually is) be stored in a database using a Database Management System (like MySQL). The tier interfaces with the business rules tier, since data may be manipulated before being displayed, as in the creation of a report. Data is returned from the tier in a format that the business rules tier (and program languages) can accept. Common formats include JSON, XML, SOAP, and datasets.

JSON—JavaScript Object Notation is a format, similar to XML, to store and exchange data. JSON can be viewed within an editor or browser. It is most commonly used to pass data between tiers.

XML—Extensible Markup Language is a markup language, similar to HTML, to store and describe data. XML can also be used to transmit data between tiers. We will provide an example of XML in Chapter 3.

SOAP—Simple Object Access Protocol is used to exchange data with a web service. It works with HTTP (Hypertext Transfer Protocol) and SMTP (Simple Mail Transfer Protocol) to provide communication between an application and a web service.

Web Service—An application, without an interface, that can be called to process information. A web service can provide the functionality of the business tier and/or data tier remotely on a web server. The Web Services Description Language (WSDL) is used to describe calls to the web service and the format of information accept and returned by the web service. WSDL is similar to XML.

Validation with the data tier is done in the Database Management System and/or via program code. Validation in this tier is the last chance to make sure data is reliable and accurate before the database is updated. It is much easier to catch validation problems before they are stored than after invalid information has been recorded.

Data storage can be local and/or remote. Mobile devices can restrict storage to local databases (smart phones), but can also use **WSDL** (web services) to store and retrieve information remotely on a server or within a cloud (such as Microsoft Azure). Additionally, many applications save small amounts of information locally with cookies, or larger amounts of information in remote databases.

Microsoft Azure—Microsoft Azure is a cloud platform that provides data services, app services, and network services. Visual Studio Applications can be uploaded and secured in the Microsoft Azure cloud.

63