attachmate

WHITE PAPER

Integrating Mainframe Systems in Microsoft® Environments

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Integrating Mainframe Systems in Microsoft Environments

Many organizations are using the Microsoft® .NET Framework to respond to growing business demands. They're developing a range of new solutions including portal applications, web self-service applications, and mobile applications.

For maximum effectiveness, new applications need to include data and logic from other enterprise applications. Microsoft BizTalk® Server, which delivers integration capabilities such as mapping and orchestration, is widely used to do application integration.

When scoping an integration project, remember that the core functionality needed to drive new applications is typically right where it's been for decades—locked inside mainframe systems. This paper presents the challenges of integrating mainframe applications and discusses options for including mainframe-application functionality in a Microsoft development environment. You'll learn how you can expand the reach of BizTalk Server 2004 or 2006 and Microsoft Host Integration Server 2004 to provide a complete mainframe-integration platform for Microsoft developers.

About BizTalk Server and Host Integration Server

The adapter framework delivered with BizTalk Server enables integration with a large variety of third-party applications. What's not included is bi-directional, real-time connection to commonly used mainframe applications by default.

Here are the general points to consider: BizTalk Server is complemented by Host Integration Server, with its data-level and transaction-level access to mainframe applications. The Transaction Integrator (TI) design tool in Host Integration Server provides direct access to IMS transactions. The TI also provides access to certain CICS transactions, but there are significant limitations, as we will discuss below.

The Legacy-Integration Challenge

As IT professionals know, accessing mainframe applications for integration with other systems can be a slow, difficult job. That's because mainframe applications usually do not provide a clear separation of data and logic. Instead, the business logic is tightly entwined with a variety of data and presentation logic.

While most modern packaged applications offer well-defined interfaces that expose data and logic from these applications as COM, .NET, or web services, few legacy applications do. For applications without a well-defined interface, only a few options remain: direct access to IMS or CICS transactions, direct-data access, or access through the screen interface.

Let's start by looking at direct access to IMS and CICS transactions, and then direct-data access. Later, we'll explore options around screen interface (presentation-layer) integration.

IMS and CICS transaction access

The most demanding systems are often built on IMS and CICS because of their high performance and scalable foundation. Unlike CICS transactions, IMS transactions are typically independent of any presentation logic. They can be accessed through a facility called Open Transaction Manager Access (OTMA).

CICS transactions present a different integration challenge. Although direct CICS access through the COMMAREA provides good performance when integrating mainframe applications, most CICS 3270 applications were not designed with a separation of the business logic from the presentation logic. In fact, only an estimated 20 to 25 percent of all CICS applications provide access through the COMMAREA.

Direct-data access

Because developers cannot access the business logic on the majority of mainframe applications, some mistakenly assume that direct-data access is the only other choice for integrating mainframe applications. They know that data can be accessed directly (especially if it resides in a relational database) by using a database driver or interface such as Microsoft Open Database Connectivity (ODBC) or OLE DB. But there are potential problems with this method:

- Business rules, which govern data use and updating, are the true value of any application. When integration is attempted through the data interface, the business rules are completely bypassed.
- Frequently, essential data exists only within the business logic, rather than at the data level. The total value of an order, for example, might be calculated at runtime by multiplying the number of units by the per-unit price, rather than being stored as a value in a database.

For these reasons, direct-data access can be both impractical and risky. Furthermore, it often requires rewriting and moving of the business logic, which are equally unfeasible. So direct-data access is a valid option only in situations where you can access meaningful data and where you do not want to update (write to) a database.

Using Host Integration Server for direct transaction-layer or data-layer access

Host Integration Server integrates resources on IBM mainframes and AS/400 systems with the .NET Framework. It functions at either the IMS or CICS COMMAREA transaction layer or the data layer.

Host Integration Server's TI designer runs in the context of the Visual Studio .NET 2003 integrated development environment (IDE). This enables Windows developers to extend IMS-based and Distributed Program Link (DPL)-compliant CICS applications as .NET components.

At the transaction layer, Host Integration Server offers programmatic access to IMS and CICS programs. As stated above, IMS transactions can be accessed via OTMA. So using the TI design tools of Host Integration Server, Windows developers can publish business rules in IMS applications as XML web services.

In the case of CICS transactions, Host Integration Server supports IBM DPL-compliant CICS access by leveraging COMMAREA data declarations. But most CICS 3270 applications have not been written for COMMAREA communications, and in these situations the TI facility cannot interact with the CICS application.

Unless the CICS application is modified so that it does not execute any terminal I/O within the business logic, CICS transactions cannot be directly accessed using Host Integration Server. And because so few CICS 3270 applications have a clear separation between business logic and presentation logic, they are often not eligible for access via the COMMAREA.

At the data layer, Host Integration Server supports ODBC drivers and OLE DB connectors for access to relational databases and flat-file structures such as IBM DB2, VSAM, and OS/400 files. As shown above, there are more practical options for integrating mainframe applications.

Attachmate: Completing the Integration Picture

Attachmate offers a number of solutions for integrating mainframe applications in the Microsoft development environment:

- **Verastream® Bridge Integrator** is a native, mainframe-resident adapter that provides COM, .NET, or web-service access to 3270 CICS data and logic.
- **Verastream Host Integrator** complements both BizTalk Server and Host Integration Server by providing Microsoft developers presentation-level integration of multiple hosts.
- **Reflection®** terminal emulation software allows host applications to be integrated with Microsoft Office applications.

Let's look at these three solutions individually:

Verastream Bridge Integrator

Verastream Bridge Integrator runs in the CICS Transaction Server and provides reliable, high-performance integration of all 3270 CICS applications, including those that are not designed for access through COMMAREA. Verastream Bridge Integrator completes the CICS integration capabilities of Host Integration Server by providing access via the IBM Link3270 Bridge rather than via COMMAREA.

It provides a direct and low-overhead method for interaction that has the performance and reliability of COMMAREA access, yet the freedom of generic 3270 access. Verastream Bridge Integrator securely exposes CICS data and business logic as Microsoft COM+ objects, .NET components, or web services.

Verastream Host Integrator

Verastream Host Integrator enables mainframe-application data and business logic to be represented as Microsoft .NET components or services. A BizTalk Orchestration can consume a Verastream-generated service, so BizTalk developers can include mainframe functionality in their Orchestrations. Once mainframe functionality is encapsulated by Verastream, the resulting service can be reused in ongoing .NET development projects. Verastream Host Integrator supports the full range of legacy hosts, including IBM zSeries (S/390), IBM iSeries (AS/400), Unix, OpenVMS, and HP e3000 systems.

Verastream Host Integrator's advanced technology eliminates the need to do any mainframe programming and can also combine services to produce higher-level business functions. Working with a library of Verastream services that can be exposed via application-integration components or web-service standards, developers can leverage any enterprise asset in a Microsoft environment. That way, a programmer doesn't have to string together several low-level tasks across multiple mainframes.

Verastream fully supports Windows Server™ 2003 and is part of the .NET Connected program for the second year running. Verastream is fully certified for Microsoft BizTalk Server 2004, and provides seamless integration between the two solutions.

Extending Microsoft SharePoint Services

Microsoft Windows® SharePoint® Services is a component of Microsoft Windows Server 2003. It lets organizations create web sites for information sharing and document collaboration. SharePoint sites are made up of Web Parts and Windows ASP .NET-based components. Microsoft Office SharePoint Portal Server 2003 is built on the Windows SharePoint Services foundation.

ASP.NET web applications, automatically generated by Verastream Host Integrator, are immediately accessible to the SharePoint Portal through the ready-to-use 'HTML page' Web Part that is shipped with Windows SharePoint Services.

In addition, custom Web Parts can be created by using the Web Parts templates in Visual Studio .NET together with .NET Class Libraries automatically generated by Verastream.

Reflection host access solutions

Reflection software contains the industry-standard development environment Microsoft Visual Basic® for Applications (VBA). By incorporating this powerful programming language, Reflection offers a seamless link to objects needed for integrating mainframe data. Here are some examples of tasks you can handle using Reflection and VBA:

- Transfer data automatically from a mainframe application to a Microsoft Excel® spreadsheet.
- Create a graphical display in Microsoft Visio® using information from your mainframe application.
- Copy information from a mainframe display and publish it on a web site.
- Transmit text from a Microsoft Word document to your mainframe application.

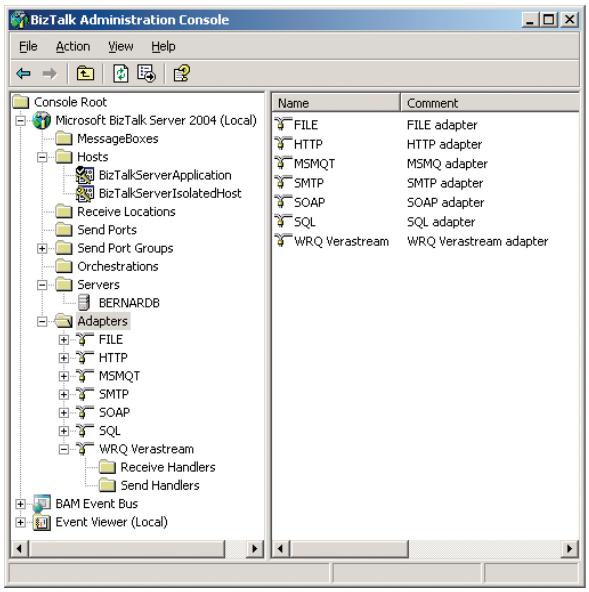
The sidebar on the last page, *Attachmate Reflection: Integrating Legacy Applications With Microsoft Office*, contains additional information and shows how sample mainframe-application data can be transferred to Excel.

How Verastream Host Integrator complements the .NET Framework

Verastream Host Integrator provides connectors for a variety of programming languages and environments. Extensive support for .NET reflects a strong Attachmate commitment to Microsoft technologies. Using the Verastream .NET connector, developers can easily create .NET applications that include important mainframe-application data and logic. Verastream automatically produces:

- .NET Class Libraries
- .NET Web services
- ASP.NET® and ASP Web applications
- Visual Basic ActiveX® DLLs

Verastream Host Integrator generates all necessary project files so the source can be quickly viewed, modified, and rebuilt with Visual Studio .NET and Visual Basic 6. Because .NET developers can integrate legacy components without leaving the Visual Studio .NET environment, they can be more productive.



BizTalk Server 2004 Administration Console with the Verastream BizTalk adapter.

How Verastream Host Integrator complements BizTalk Server

BizTalk Server 2004 (launched in March 2004) was completely built on top of the .NET Framework. Changes in the 2004 version of the BizTalk Server tools included integration into Visual Studio .NET. The result was that the new BizTalk development tools were all exposed through the Visual Studio IDE interface. BizTalk Server 2006, the product's fourth major version, was released in November 2005.

Verastream Host Integrator takes advantage of Orchestration and Visual Studio .NET, allowing BizTalk/.NET developers to operate fully in a familiar environment. Host services provided through Verastream Host Integrator can be designed into business processes from within the BizTalk Orchestration Designer and accessed at runtime from BizTalk Server.

Verastream Host Integrator and BizTalk Server: The technical details

Verastream Host Integrator includes an interface for BizTalk that includes an adapter designed for the BizTalk adapter framework. The interface makes it possible to design and execute BizTalk Orchestrations that access mainframe applications, without leaving the BizTalk environment.

The Verastream interface for BizTalk Server delivers two types of connections through the BizTalk adapter, plus a web service connection (the Metadata Harvester), and a schema builder. These four elements are explained below.

- **Verastream Host Integrator Table Connector**. During the Verastream modeling process, tables are defined by creating a list of database columns that name the data elements. Procedures—including select, update, insert, and delete—can be combined to perform a complex series of transactions. Using the Verastream tables and procedures, application developers can then work with unstructured mainframe applications just as they would with any standard database.

  The Verastream Table Connector is a high-speed interface that provides direct access to Verastream tables and procedures. Procedures can be individually selected to deliver mainframe services to any BizTalk business process. BizTalk submits an XML document with the appropriate input filters and Verastream responds with a .NET DataSet in the returned XML document.

- **Verastream Host Integrator ProcessString Connector**. If a highly customized response from a mainframe can't be delivered via Verastream tables and procedures, the ProcessString Connector provides a mechanism for a BizTalk Orchestration to pass an XML document to Verastream Host Integrator. The document can contain any set of inputs and instructions. A custom ProcessString event handler within a Verastream model processes the document, executes the event handler code, and returns an XML result document.

- **Verastream Host Integrator Metadata Harvester**. The Verastream Metadata Harvester allows the BizTalk Orchestration to query a published Verastream-generated .NET web service, discover the available procedures, and include selected procedures in a business process created with BizTalk. The Verastream Metadata Harvester streamlines the user experience through BizTalk Orchestration Designer support for .NET web services. BizTalk developers choose .NET web services to access Verastream Host Integrator when the higher performance offered by the Verastream Table Connector is not required.

- **Verastream Host Integrator Schema Builder**. The Verastream Schema Builder automates construction of a document schema that exposes selected Verastream procedures in a way that is consistent with the requirements of the BizTalk Mapper. (The BizTalk Mapper maps XML documents from different systems to facilitate data flow during a business process.) The Verastream schema builder is accessed from the BizTalk Orchestration Designer and presents a standard BizTalk Wizard user interface.

The steps that make it happen

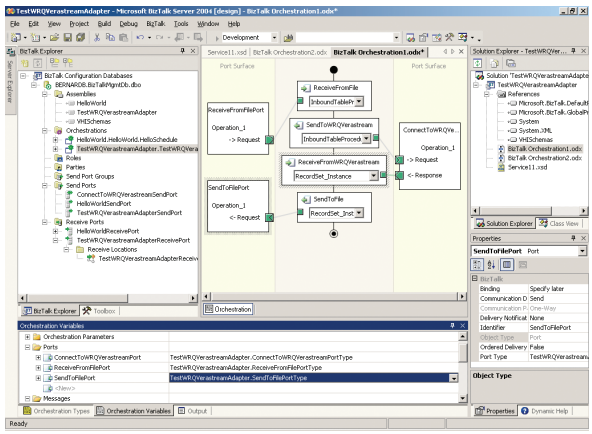
In a typical scenario, a web service or other application passes an XML message to a BizTalk Orchestration in a message queue. The BizTalk Orchestration processes the XML message and invokes the Verastream BizTalk adapter. The adapter parses the XML document, connects to the mainframe application, makes the appropriate API call, and retrieves the requested data. Next, the adapter converts the retrieved data to XML and returns it to the BizTalk Orchestration as an XML message. The BizTalk Orchestration then places the XML message in the message queue, where it is picked up by the requesting web service or application.

With the Verastream interface for BizTalk Server, BizTalk developers can include mainframe-application data and logic that is accessible only through the terminal interface. The tight integration of Verastream Host Integrator with BizTalk Orchestration Designer and BizTalk Mapper lets developers access mainframe services from the familiar BizTalk user environment. Benefits for BizTalk developers include:

- Increased productivity through integration of legacy components without leaving BizTalk Orchestration.
- Expanded scope of possible projects through inclusion of mainframe-application data and logic.
- Ability to leverage current development tools and skill sets when working with Verastream Host Integrator.
- Reduced learning curve associated with mainframe-integration projects.

How Verastream complements Host Integration Server 2004

Host Integration Server and Verastream address the complete integration needs of .NET and BizTalk developers in different but complementary ways. While Host Integration Server provides integration at the data and transaction levels, Verastream Host Integrator uses the presentation interface to access mainframe applications. In addition, Verastream Bridge Integrator extends the CICS integration capabilities of Host Integration Server by exposing generic 3270 CICS data and business logic as Microsoft COM+ objects, .NET components, or web services through the IBM Link3270 Bridge rather than the through COMMAREA.



Verastream Host Integrator takes advantage of BizTalk Orchestration, letting BizTalk developers operate fully in a familiar environment.

Which approach is better for successfully integrating data residing on a mainframe application? That depends on the design of the mainframe application and the integration requirements. As discussed on page 1, if a project requires access to the business logic, and direct access to CICS or IMS transactions is available (for example through CICS COMMAREA), integration at the transaction level will in most situations be the preferred approach to maintain high performance and availability. If a development project requires data that is readily available in a mainframe database, direct-data access might be the right approach.

Presentation-level access using Verastream Host Integrator

In situations where direct-data access is not feasible, the application is not using an IMS or CICS transaction platform, or it is not possible to install a mainframe resident adapter in the CICS Transaction Server to access non-DPL-compliant application, presentation-level integration is the preferred choice. A completely non-invasive process, presentation-level integration does not require changes to the legacy application.

Host Integration Server supports data and transaction-level integration with IBM mainframe and AS/400 systems. Verastream Host Integrator provides presentation-level integration services for those IBM systems, as well as for green-screen applications running on Unix, OpenVMS, and HP e3000 systems.

Verastream Host Integrator and Host Integration Server can work together in other ways as well. When legacy applications can be accessed only over IBM SNA networks, Verastream Host Integrator can access those applications through Host Integration Server telnet gateway services.

Verastream Host Integrator, together with Host Integration Server 2004, offers developers the most complete mainframe-integration platform available, enabling integration at the data, transaction, and presentation levels.

A Business Scenario: Using Verastream Host Integrator in a Microsoft Environment

In order to decrease costs, increase sales efficiency, and improve customer satisfaction, an electronic-equipment vendor has decided to:

- Build a web application that integrates information from a variety of systems, to present a 360-degree view of the customer's ordering process.
- Provide a portal where customers can find product information and place orders online.

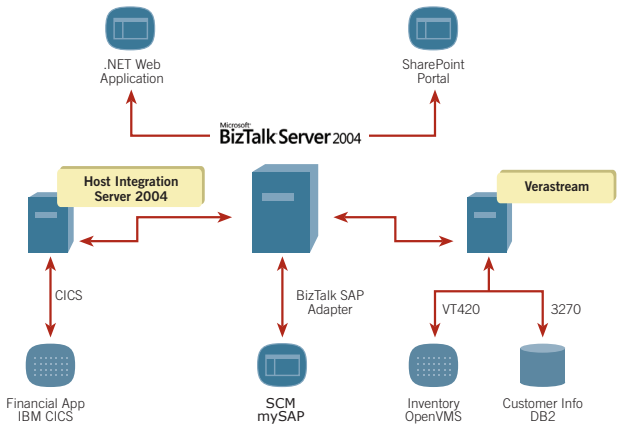
The information needed to support these two initiatives resides on diverse systems, including:

- Inventory, running on an OpenVMS platform.
- Customer information, in an IBM DB2 database.
- Financial information, in an IBM DPL-compliant CICS application.
- Supply chain management, on mySAP.™

This IT organization has standardized on the .NET Framework and is using BizTalk Server 2004 as an application integration platform. The Microsoft BizTalk Adapter for SAP allows for integration of the BizTalk Server with the organization's existing SAP environment.

The development team soon realizes that inclusion of the supply chain management information in both projects can be done easily by using BizTalk together with the BizTalk Adapter for SAP. However, both the web-based application and the portal application need to include data and logic that reside on IBM and OpenVMS platforms.

Host Integration Server 2004 is used as an adapter to BizTalk 2004 to access, through COMMAREA, the DPL-compliant CICS-based financial application running on the IBM mainframe. Initially, the development staff considered Host Integration Server for access to the DB2-based customer information, using an ODBC driver. However, this customer information needs to be updated frequently, and by accessing the data in the DB2 database directly, the development staff would be forced to rebuild all the database rules and business logic.



Verastream Host Integrator and Host Integration Server 2004 provide a complete host-integration platform.

Instead, by using Verastream Host Integrator in conjunction with Host Integration Server, the development staff was able to include data and logic from all mainframe systems, including customer information and the inventory system. Using the screen interface, developers encapsulated inventory data and logic, as well as customer data, which were made available through a web services, .NET, or ASP.NET interface.

From BizTalk, a developer was able to define Orchestrations that included supply chain management, financial, customer, and inventory processes or information. Within Microsoft SharePoint Portal Server, the legacy data and logic could be displayed directly as Web Parts, without BizTalk 2004.

The Microsoft + Attachmate Advantage

Having been at the vanguard of host access and integration for more than 25 years, Attachmate works closely with Microsoft to connect legacy applications with the Windows operating system and Office applications. Simultaneous Attachmate priorities include integration with Microsoft Windows Systems servers and Microsoft development tools.

Combining Attachmate and Microsoft solutions means that legacy applications do not present a barrier when deploying new applications in heterogeneous environments. Specifically, Attachmate Verastream complements a variety of Microsoft products by providing an adaptable, service-oriented approach to legacy application integration. Verastream benefits include:

- Support for the .NET Framework, integration with Visual Studio .NET, and automated ASP.NET web application generation.
- Extended reach of BizTalk with the added inclusion of legacy functionality.
- Increased developer productivity through the integration of legacy components without leaving BizTalk Orchestration or Visual Studio .NET environment.

In addition to being complementary to Microsoft Host Integration Server, Verastream Host Integrator is SharePoint-ready through automated ASP.NET Web application generation. Verastream Host Integrator runs on Windows Server 2003 and deploys easily to Microsoft IIS Server.

A Range of Integration Solutions

Legacy applications contain critical data and logic that often slow development cycles. Attachmate offers Microsoft developers the tools to successfully complete the last step of their integration project. Whether your IT needs call for basic rejuvenation, customized presentation, or sophisticated service-oriented integration, you can count on the expertise offered by Attachmate. We've been optimizing legacy systems for more than 25 years.

The Attachmate Verastream legacy integration suite provides a complete range of mainframe, web, and desktop integration tools for use in service-oriented architectures. Verastream-generated services can be mixed, matched, and reused selectively to extend legacy functionality to new applications or new users. No code changes to legacy applications are required.

Attachmate Reflection: Integrating Legacy Applications With Microsoft Office

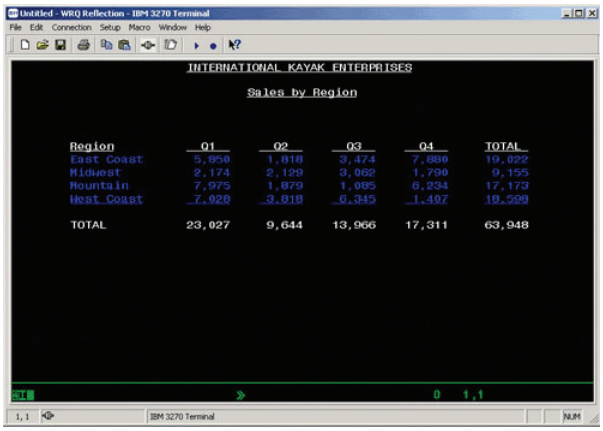
Reflection host access software supports many Microsoft technologies including Windows Group Policy, Active Directory® services, Windows Terminal services, Microsoft Installer Technology, and Kerberos security, as well as web services. Furthermore, Attachmate has integrated VBA into Reflection.

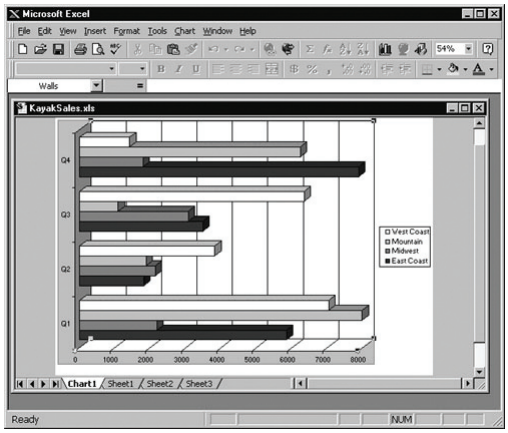
Designed for Microsoft® Windows® XP, 2000, ME, 98, Windows NT®

VBA is a powerful development technology for customizing rich-client desktop applications and integrating them with existing data and systems. VBA provides an IDE that features elements familiar to developers using Visual Basic. Many applications (including Microsoft Office applications) also include VBA.

With VBA, Reflection gains programming features that enable it to integrate with other applications and data throughout an organization. You can use VBA to customize and enhance Reflection. You can also create macros that allow Reflection to integrate legacy applications (on IBM, HP, OpenVMS, or UNIX host systems) with other applications.

For example, using a Visual Basic macro, you can transfer host data to Microsoft Excel and create a graphic display as shown below. On the left screen, you see a Reflection connection displaying sales data in an IBM mainframe application. With a few mouse clicks, the data is transferred to a dynamic display like the one on the right.





About Attachmate

Attachmate, owned by an investment group led by Francisco Partners, Golden Gate Capital, and Thoma Cressey Equity Partners, enables IT organizations to extend mission critical services and assure they are managed, secure, and compliant. Attachmate's leading solutions include host connectivity, systems and security management, and PC lifecycle management. Our goal is to empower IT organizations to deliver trusted applications, manage services levels, and ensure compliance by leveraging knowledge, automation, and secured connectivity. For more information, visit **www.attachmate.com**.

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