

Key Trends

- Occasionally connected clients will avoid thin clients. They will require thick clients that have presentation, application logic, data and data management resident locally.
- Most early C/S applications used data passing, had two tiers and performed synchronous processing. Future C/S applications will use more message passing, have three (or more) tiers and perform asynchronous processing.
- Vendors of field automation application software are continuing to move away from developing bundled, proprietary communications transport software and will instead license this capability from mobile C/S vendors.
- Field workers will require integrated online and deferred access to enterprise voice and data resources. Leading vendors will work to provide this capability.

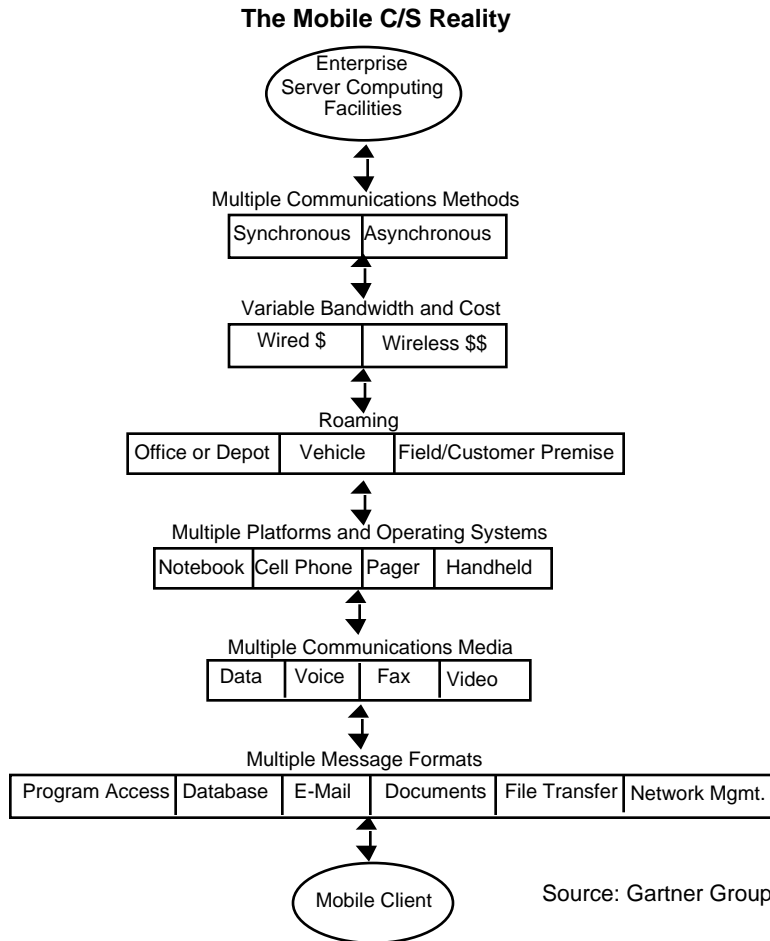
Occasional Remote

Reader Notes



1. How will mobile computing affect C/S architectures?
2. What components and techniques will emerge to support deferred C/S access by mobile and remote workers?
3. Which vendors will supply technologies for mobile C/S?





Mobile users are different from typical office workers. They are presidents of companies, salespeople and delivery persons — all have job priorities that rank above the need to interact with a computer. Many mobile workers succeed without the daily use of computing resources. For example, the delivery person's primary mission is to deliver a package, not to learn to use a computer. While computing can be essential to making the delivery more reliable and customer-oriented, *too much* technology can get in the way. As it is, computing for mobile workers is more complex than for desk-bound workers. Mobile workers must contend with less reliable network connections, and they must navigate and monitor the vagaries of multiple messaging and communications media, which represent their "life line" to the rest of the enterprise and to the outside world. These media include: fax, voice, data and (soon) video. Mobile workers sometimes require online communication links to the enterprise, while other times they need less time-consuming and expensive deferred connections. Communication requirements are also dictated by the worker's environment and the connections available in that environment. Finally, users must rely on different devices for communication.



Mobile communication remains a poorly designed extension of the connected world. Today's initiatives must be overhauled to provide acceptable long-term functionality.

<i>Initiative/Approach</i>	<i>Key Mobile Weakness</i>
Terminal Emulation	<ul style="list-style-type: none">• Mainframe-centric; no asynchronous operation
Remote Control	<ul style="list-style-type: none">• No asynchronous operation
Remote-Node Access	<ul style="list-style-type: none">• No asynchronous operation
E-Mail	<ul style="list-style-type: none">• Poor integrity for attached files
Message Queuing	<ul style="list-style-type: none">• Server-centric
Lotus Notes	<ul style="list-style-type: none">• Not general-purpose; LAN metaphor
DCE	<ul style="list-style-type: none">• RPC-based
CORBA	<ul style="list-style-type: none">• Mobile concepts not integrated
Microsoft Exchange	<ul style="list-style-type: none">• Not available; narrow focus

Source: Gartner Group

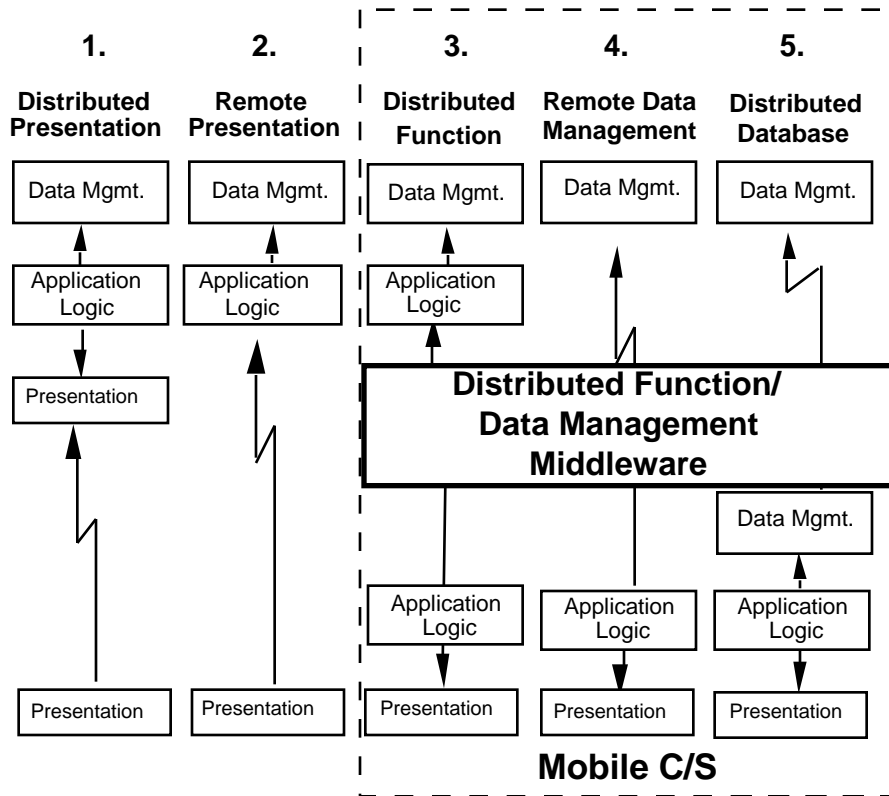
Key Issue: How will mobile computing affect C/S architectures?

Given the new requirements for mobile C/S, we must examine whether current and future C/S middleware offerings will meet these needs. Some of the more popular products and initiatives are listed above. The biggest flaw in many of these products is that they are designed for an environment that is synchronous and part of a tightly coupled C/S pair. Even Lotus Notes, which has been cited as a mobile solution, offers a synchronization method that occurs only when both the client and the server are connected (albeit by a low-speed phone line). In addition, Notes offers synchronization services only for information residing in Notes. External data cannot be synchronized unless it is brought into Notes. Future initiatives (e.g., the Distributed Computing Environment) will assume an RPC metaphor — again, a synchronous method. Message queuing products (e.g., IBM's MQ-Series) are candidates to serve mobile workers, but they focus primarily on server-to-server messaging for databases. These products must become more versatile and include support for mobile clients.



By 1998, deferred connections based on intelligent messaging will be the preferred communications approach for C/S applications written for the highly mobile worker (0.8 probability).

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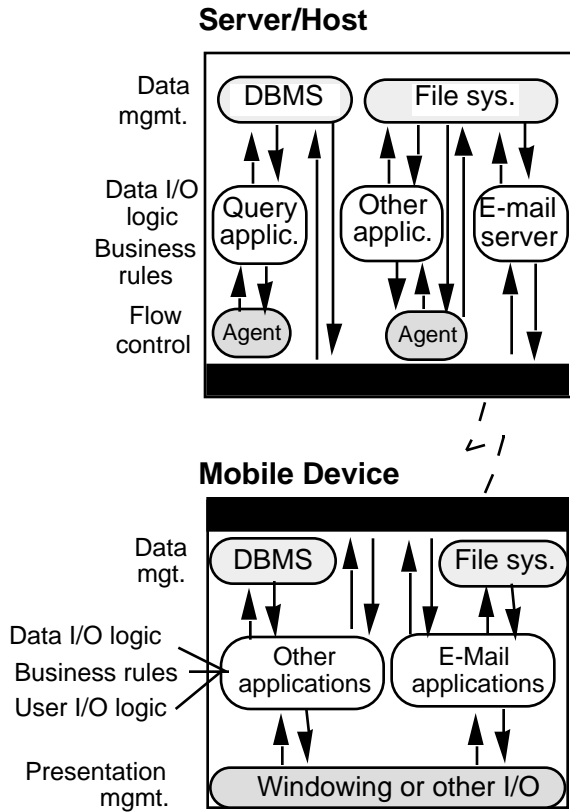
Key Issue: How will mobile computing affect C/S architectures?

The mobile-computing reality will require end-user developers, VARs, ISVs and others to revise their designs when writing C/S applications for disconnected (including mobile) workers. Most C/S applications written today assume an online, high-bandwidth connection between the client and the server, and they fail to acknowledge the multiple devices, connection methods and the like on which mobile workers typically rely. By combining C/S approaches (specifically Styles 3 and 5), and by leveraging emerging types of distributed-function middleware, developers can provide solutions with sufficient value and functionality to serve this growing segment of users. Choosing among available communications methods is a critical decision for IS and business managers. Here, again, enterprises often try to replicate the desktop paradigm by using online connections (e.g., remote control, remote node or even terminal emulation). For most new applications, however, deferred connections based on intelligent messaging will be better-suited to the needs of the mobile work force.



Mobile communications will continue to involve high costs, low bandwidth and low latency during the next five years, forcing the adoption of a three-tier architecture using thick clients — contrary to general C/S trends (0.8 probability).

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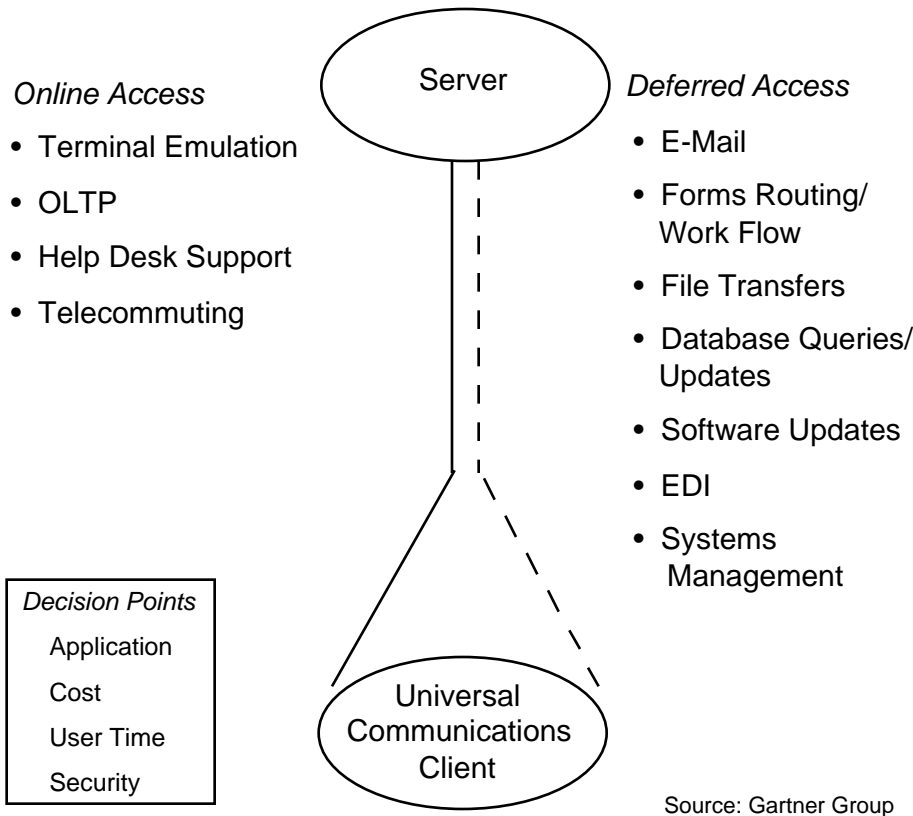
Key Issue: How will mobile computing affect C/S architectures?

Many C/S pundits say the “end game” of the exercise will be to return to the starting point — namely, as communication costs decrease and bandwidth increases, all applications will be simply terminal emulation. While that may be in the long term, C/S design for mobile communications will be dictated by slow, intermittently operational, high-cost communication facilities. We do not expect this to change during the next five years. All mobile-computing applications will be forced to confront these issues through a design that permits users to do as much work as possible without back-end resources. Communication sessions will be used for the unattended transfer of data, not to allow the user to ponder a problem while the communication line is active. This will force an architecture that maintains application, presentation and data management resources locally — that is, a thick client. The architecture will also move to three tiers, where thin transactions can be expanded into robust transactions through agent technology.



By 1998, integrated remote-communication products that deliver equivalent functionality in deferred and online mode will be available to the mobile work force (0.8 probability).

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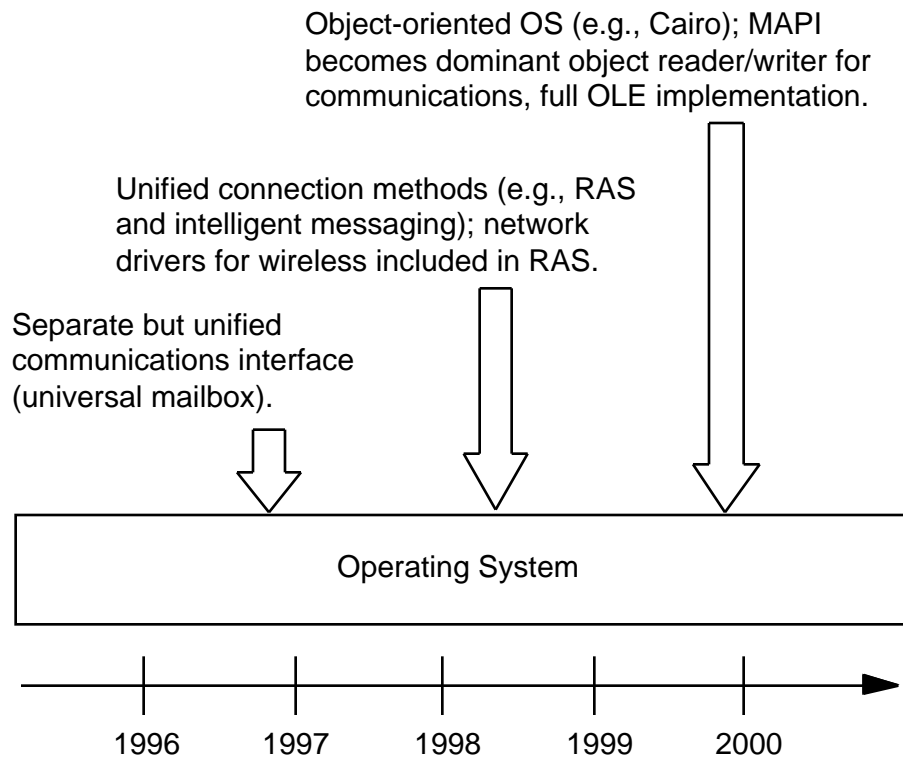
Key Issue: How will mobile computing affect C/S architectures?

For IS organizations seeking communication links between mobile workers and corporate (or third-party) systems, many alternatives are available. At the highest level, IS managers must decide whether the communication session should be conducted online or using a deferred-access (store-and-forward) paradigm. Today's products are typically designed around one approach or the other, but integrated products supporting online *and* deferred access will be available by 1998. By 2000, IS managers should expect 70 percent of applications for mobile workers to rely on deferred access while 30 percent continue to use online connections. Meanwhile, IS managers who have justified the need for both approaches will be forced to select, install and support one product from each camp, and then they will have to decide which to use on a case-by-case basis. This decision will be driven by: 1) the application itself; 2) the relative cost of one approach vs. the other; 3) the time that users will be required to spend on the network; and 4) security considerations.



All elements of the mobile C/S architecture will reside at the operating system level by 2000 (0.7 probability).

Reader Notes



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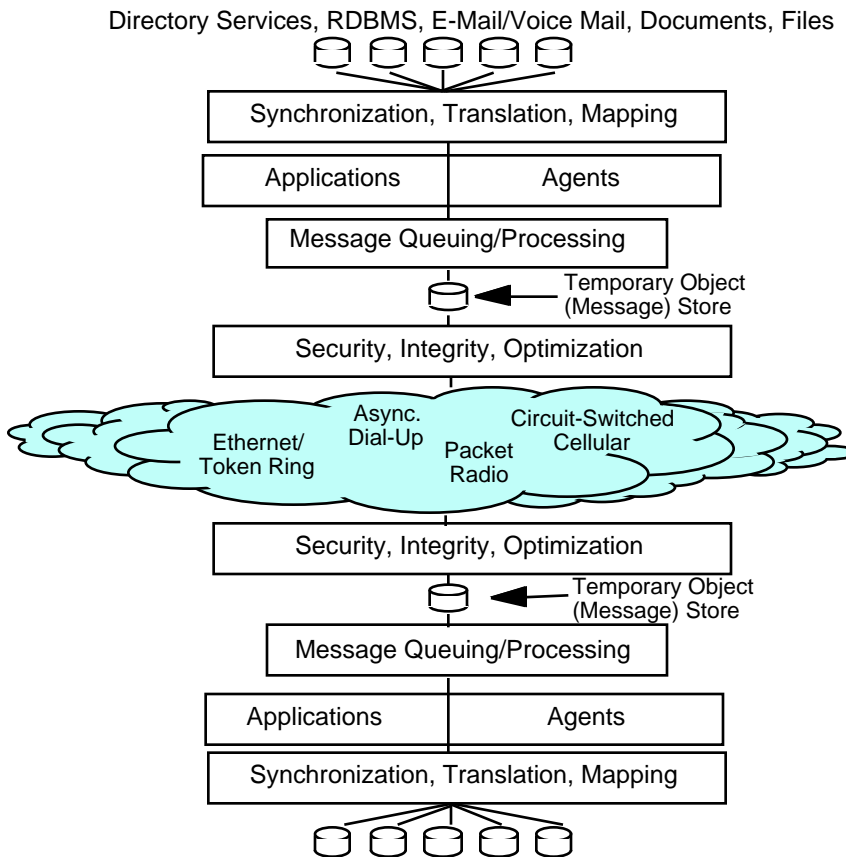
Key Issue: How will mobile computing affect C/S architectures?

The “deferred communication” metaphor will become an integral part of the operating system during the next five years. This will come about in several steps (shown above). It will be motivated partly by: 1) the push to object-oriented software, specifically distributed object initiatives, 2) the growth in mobile computing, 3) user requirements to maintain a single set of software for mobile-communications support, and 4) the need to provide server resources without user involvement while servicing each individual transaction.

Microsoft, through initiatives like Cairo, OLE, ODBC and MAPI among others, will incorporate a “distributed objects” metaphor in the operating system. This will provide the framework for consistent mobile C/S processes. Once asynchronous operation is implemented for distributed objects, the final pieces will be in place. Third parties will build on this framework to provide a variety of products, but these products will focus on synchronization and administration — not on infrastructure, which is the focus today.



What new components and techniques will emerge to support deferred access to C/S applications?



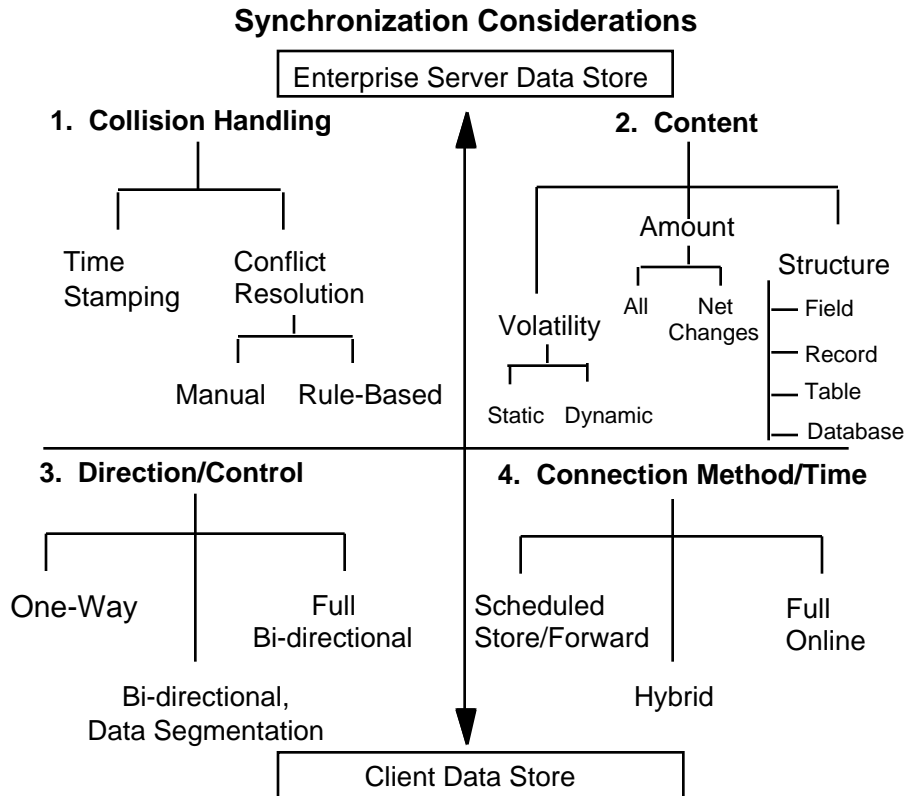
Source: Gartner Group

Communication products based on deferred, store-and-forward message delivery must provide certain functionality to satisfy the requirements of application developers and the mobile workers they support. Some of this functionality may be delivered as a component of an integrated application solution, as has traditionally been the case in sales force automation. In the future, mobile C/S vendors will deliver this functionality as part of integrated communication solutions that are separate from specific applications, or they will focus on a specific area (e.g., optimization or synchronization) and provide best-of-breed functionality in that area. Users must understand the contribution and benefits of each component, and they must evaluate the vendors' ability to deliver the necessary functionality, keeping in mind that the functionality may ultimately come from a combination of hardware providers, network service providers, commercial application developers and mobile C/S vendors.



Enterprises will be able to reduce costs by as much as 50 percent by: 1) segmenting the database, 2) distributing net changes only and 3) using store-and-forward communications (0.8 probability).

Reader Notes



Source: Gartner Group

Key Issue: What new components and techniques will emerge to support deferred access to C/S applications?

Because more mobile workers are occasionally accessing centrally stored data, reliable synchronization has become critical for field automation projects. IS managers must set synchronization expectations carefully, because any synchronization process that involves mobile users reflects a moment in time and may be rendered obsolete at any time. As a result, users should carefully weigh the costs against the incremental benefits of different approaches. Users must answer five questions regarding synchronization: How are conflicts resolved? What data is being synchronized? Who owns the data, and who can make changes? What type of connection is used? Finally, when does synchronization take place? Other issues include: 1) the ability to synchronize multiple remote databases to a server and across multiple server-to-server configurations; 2) separate extract and transport functions so users can select best-of-breed; 3) synchronization with other communications in a single session; 4) transport independence; 5) multiple platform support; 6) scalability; and 7) ease of use.



Queue management technology will become an integrated requirement for all C/S transport middleware by 1999 (0.7 probability).

Reader Notes

Key Requirements for Message Queuing Software

Communications Integrity

- Ensured message delivery
- Message prioritization
- Check-point restart/retransmission
- Error handling
- Message logging
- System alerts
- Security
- Message recoverability across different resources

Application Enhancement

- Shielded from application
- Shielded from network complexities
- Time-independent delivery
- Interoperability

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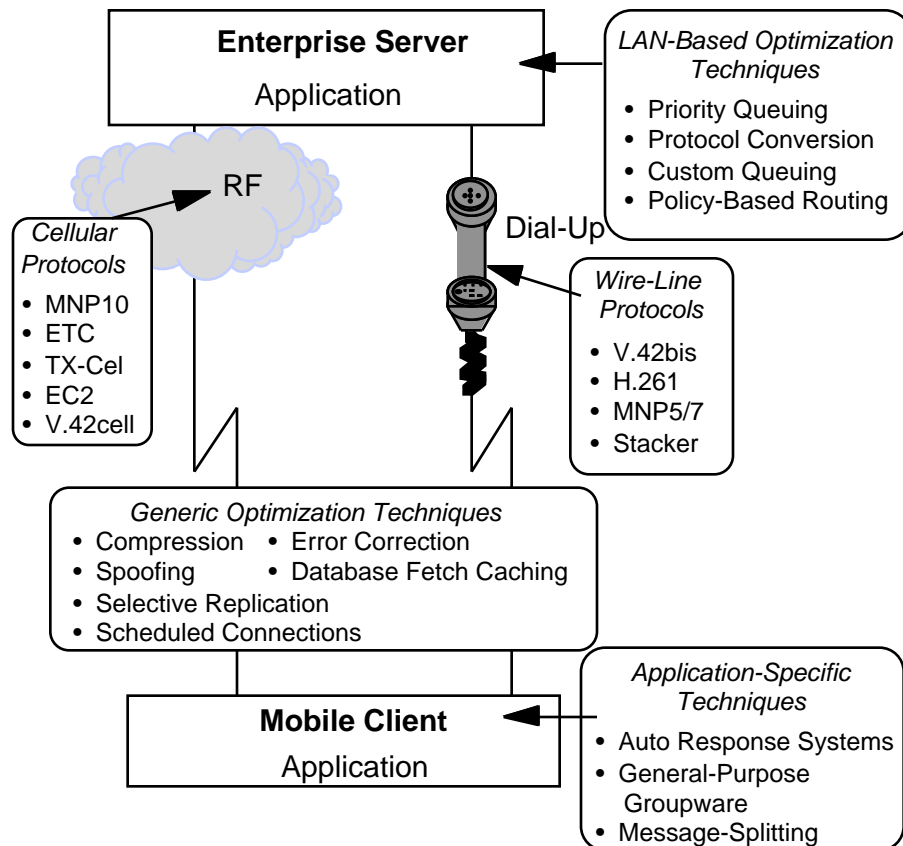
Key Issue: What new components and techniques will emerge to support deferred access to C/S applications?

For many enterprises, communicating with mobile workers is simply an extension of the in-house design. Communicating online using remote-node access is today's most popular method. To move to deferred communication, a queuing methodology is needed. The introduction of queuing services must not diminish the requirements to maintain a reliable C/S environment. Enterprises should use the above list to assess the queuing technology of any product offering. Many users fail to consider these requirements when implementing a transfer mechanism using one of the popular E-mail products (e.g., Lotus' cc:Mail or Microsoft's MS-Mail). While E-mail offerings have some of the above capabilities to safeguard the message, they do not safeguard the content of attached files, leaving this task to the application programmer.



Through 1998, users must assemble optimization strategies, and they cannot rely on individual vendors to provide complete optimization for remote control.

Reader Notes



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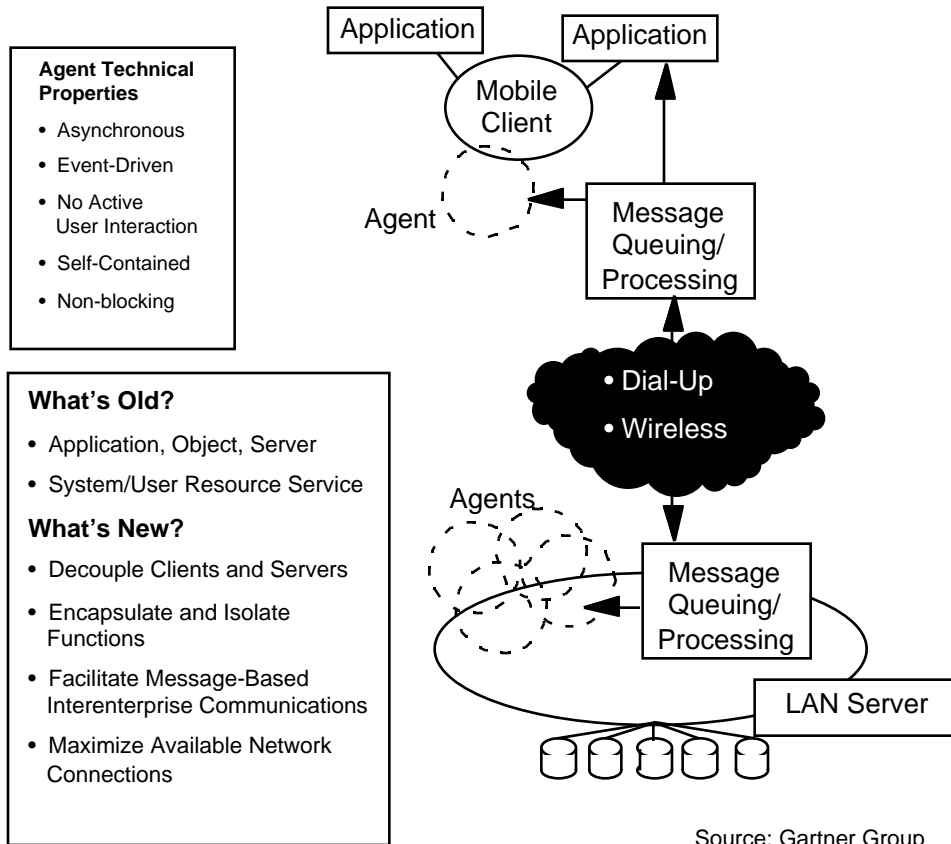
Key Issue: What new components and techniques will emerge to support deferred access to C/S applications?

Remote users typically connect to office-based systems at 1/2,000th the speed available to office workers. To overcome the limitations of these low-bandwidth, high-latency connections, vendors of online and deferred remote-access products are using a variety of optimization techniques. Generic optimization techniques offer proven performance regardless of application design. LAN-based optimization techniques, originally designed to help LAN managers control local message traffic, can be used to improve performance for mobile workers by giving priority to remote connections when they occur. Application-specific optimization is a strategic direction for next-generation remote-user applications, because message-handling decisions can be made in the context of application requirements. Enterprises should use as many optimization techniques as are appropriate.



Agents will become a key part of mobile C/S applications because of their ability to optimize application operation, network resources and mobile workers' time (0.8 probability).

Reader Notes



Key Issue: What new components and techniques will emerge to support deferred access to C/S applications?

We have defined an agent as a dynamic software entity (i.e., a service, application or object) that is self-contained and that performs tasks on behalf of a user or user-initiated process. As with most technology developments, an agent has not been “cut new from whole cloth.” (Note that, according to the definition, an existing application or network service can, in fact, be an agent). The “agent” that mobile C/S vendors use is typically system software that performs tasks that could be performed without an agent (albeit much less efficiently). Mobile C/S vendors must try to optimize processes that involve occasionally connected clients and servers, and they may do so using software entities (called “agents” or not) that have intrinsic technological properties that users should seek when evaluating products. These entities should be asynchronous, be event-driven, require no active user interaction, be self-contained and be non-blocking.



Microsoft will dominate the standards framework for mobile C/S through 2000 (0.7 probability).

Reader Notes

Architectural Layer	Standard	Adoption Probability
Synchronization, Translation and Mapping	SOM/DCE	0.4
	OLE/COM	0.6
	MAPI	0.7
	VIM	0.1
	ODBC	0.7
	XAPIA	0.4
	X.500	0.6
Temporary Object (Message) Store	OpenDoc	0.3
	OLE	0.7
	HTML	0.6
	Telescript	0.2
	EDIFACT	0.6
Transport	IP	0.4
	IPX	0.3

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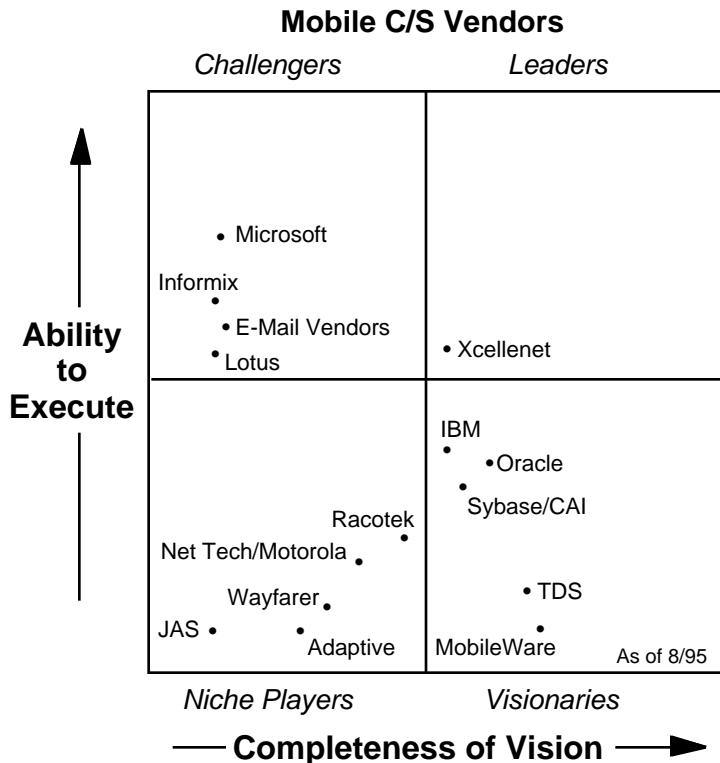
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The standards battle has yet to begin for the mobile C/S architecture. This battle will bring together many diverse initiatives heretofore thought to be independent. However, the mobile worker's need to consolidate communication sessions will force the players together. Many standards efforts will fail because they are based on the continuously connected, desktop paradigm. Some may fail because they require a new infrastructure — a costly proposition (Telescript). In the end, however, the standards winners will most likely align with the winners in the operating-system distributed-objects battles, because communication will become a component of low-level software. Microsoft will emerge as the winner, because of its position and the number of developers that will make up for design shortcomings.



Which vendors will supply the technologies for mobile C/S?

Reader Notes



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|--|-------------------------------|
| Microsoft (Exchange, various products) | Lotus (LCS) |
| Xcellenet (RemoteWare) | IBM (MQ Series) |
| Oracle (Mobile Agents) | Sybase/CAI (EMS) |
| Racotek (Keyware) | Net Tech/Motorola (AirMobile) |
| Adaptive Strategies (MobileSync) | TDS (Worldlink Exchange) |

Source: Gartner Group

For clients who want to implement mobile C/S applications today, the most-complete deferred-communication products come from the specialized vendors, which include XcelleNet and TDS. Although some users have constructed “one-off” solutions using E-mail products (e.g., Lotus’ cc:Mail Remote or Microsoft’s Mail Remote), this approach will fall short as application requirements expand. As specialized vendors continue to adapt to more-open and more-standard technologies (for their container architecture, server platform, development tools and so on), they will continue to attract the interest of user organizations and large database and messaging vendors that want to improve their own standing in this area. Database vendors have stepped up efforts to address mobile workers (e.g., Oracle’s release of Oracle Mobile Agents and Sybase’s acquisition of Complex Architectures). Since store-and-forward delivery is a prerequisite for a mobile C/S application, remote LAN access and terminal emulation vendors are not included here.



Specialized vendors* will offer well-developed mobile C/S solutions through 1996 (0.8 probability). By 1997, Sybase and Oracle will offer mature products with an installed base of reference accounts (0.7 probability).

<p>Microsoft <i>User Recommendation:</i> Select third-party applications that use and combine Microsoft standards.</p>
<p>Lotus <i>User Recommendation:</i> Lotus Notes can be used to transport part of the overall C/S model in the short term. Version 4.0 enhancements will open the door for third-party solutions.</p>
<p>Oracle <i>User Recommendation:</i> Users must be prepared to develop internally or rely on a VAR. Ask for user reference accounts, not just VAR references, and for demonstrable integration with non-Oracle back-end systems. Understand that Oracle Mobile Agents does not include agents.</p>
<p>Sybase/CAI <i>User Recommendation:</i> Despite the acquisition, non-Sybase users may continue to consider EMS a stand-alone message gateway product.</p>
<p>*XcelleNet <i>User Recommendation:</i> Provides a robust solution for today's requirements. Investigate future integration with Microsoft products.</p>

Source: Gartner Group

Which vendors will supply the technologies for mobile C/S?

Microsoft will abdicate support of deferred communications as part of Back Office through its relationship with XcelleNet. *Key Factors:* MAPI, OLE 2.0, COM and ODBC. **Lotus** will use Notes' transport and file structure for mobile C/S architectures. Its narrow focus will weaken components during the next three years. *Key Factors:* Large cc:Mail and Notes installed base; IBM acquisition. **Oracle's** Mobile Agents will be accepted by specialized Oracle resellers and limited corporate developers, but will not be adopted widely before 1998. Oracle will enhance several basic services to work over alternative communication links, including wireless. *Key Factors:* Good understanding of sessionless computing and of disconnected C/S applications. **With Sybase's acquisition of CAI**, CAI has secured funding to further develop its EMS product and add sales and marketing resources. Sybase will integrate EMS into its "open client/open server" strategy, but will not fully integrate messaging until late 1997. *Key Factors:* Strength of CAI product. Sybase's quick integration of EMS. **XcelleNet** will remain strong in niche markets (e.g., retail data collection). It must develop a plan for its installed base to migrate to the Microsoft architecture. *Key Factors:* Proven technology. Move toward available standards.



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- Mobile communications will continue to involve high costs, low bandwidth and low latency during the next five years, forcing the adoption of a three-tier architecture using thick clients — contrary to general C/S trends (0.8 probability).
- By 1998, integrated remote-communication products that deliver equivalent functionality in deferred and online mode will be available to the mobile work force (0.8 probability).
- Enterprises will be able to reduce costs by as much as 50 percent by: 1) segmenting the database, 2) distributing net changes only and 3) using store-and-forward communications (0.8 probability).
- Queue management technology will become an integrated requirement for all C/S transport middleware by 1999 (0.7 probability).
- Through 1998, users must assemble optimization strategies, and they cannot rely on individual vendors to provide complete optimization for remote control.
- Agents will become a key part of mobile C/S applications because of their ability to optimize application operation, network resources and mobile workers' time (0.8 probability).
- Microsoft will dominate the standards framework for mobile C/S through 2000 (0.7 probability).
- All elements of the mobile C/S architecture will reside at the operating system level by 2000 (0.7 probability). Microsoft will be the dominant provider of technology, but specific solutions will be provided by third parties.
- Specialized vendors will offer well-developed mobile C/S solutions through 1996 (0.8 probability). By 1997, Sybase and Oracle will offer mature products with an installed base of reference accounts (0.7 probability).

