

R-20-4160

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**Strategic Analysis Report**  
2 July 2003

## Hype Cycle for Emerging Technologies, 2003

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*Gartner's overview of emerging technologies includes technologies that are perceived as having the most impact or that are likely to be affected by overhype. The mobile and wireless area continues to dominate in terms of innovation.*

### Management Summary

For this overview, 30 technologies were selected from more than 500 analyzed in recent research (see "Gartner's Hype Cycle Special Report 2003," AV-20-1850). Those chosen were deemed to have the most impact, or were most likely to be affected by too much hype and subsequent disillusionment. Almost half of the most dominant technologies were from the mobile and wireless arena, which is a continuing source of innovation and will keep the information and communication technology industry busy for at least another decade.

Other dominant theme clusters include information extraction, semantic Web, Web-services-enabled business models and internal Web services. These technologies allow *logical connectivity* between applications (see "Key Technology Advances From 2003 to 2012," AV-18-8822). Another cluster drives *embedded computing*, such as 802.15.4, micro fuel cells, organic, light-emitting diodes and light-emitting polymers, passive radio frequency identification, microelectromechanical systems and location-aware services. Yet another technology reviewed is trusted computing platforms, a hardware-based, distributed resource management solution. It has the potential to change business models once again in the software and information industry.

This Hype Cycle is not meant to be a comprehensive portfolio. Technologies from previous years' versions were excluded if they have not moved forward — for example, peer-to-peer computing, wireless Web, identity services, nanocomputing, speech recognition on desktops, e-payments and public key infrastructure. Also, technologies were excluded if they have received little attention from IS organizations.

Another reason for the apparent disappearance of some technologies is that they have been split. For example, grid computing has been divided into commercial and scientific grids. Web services has been split into external and internal Web services, and Bluetooth has become Bluetooth cable replacement and Bluetooth networking.

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# Hype Cycle for Emerging Technologies, 2003

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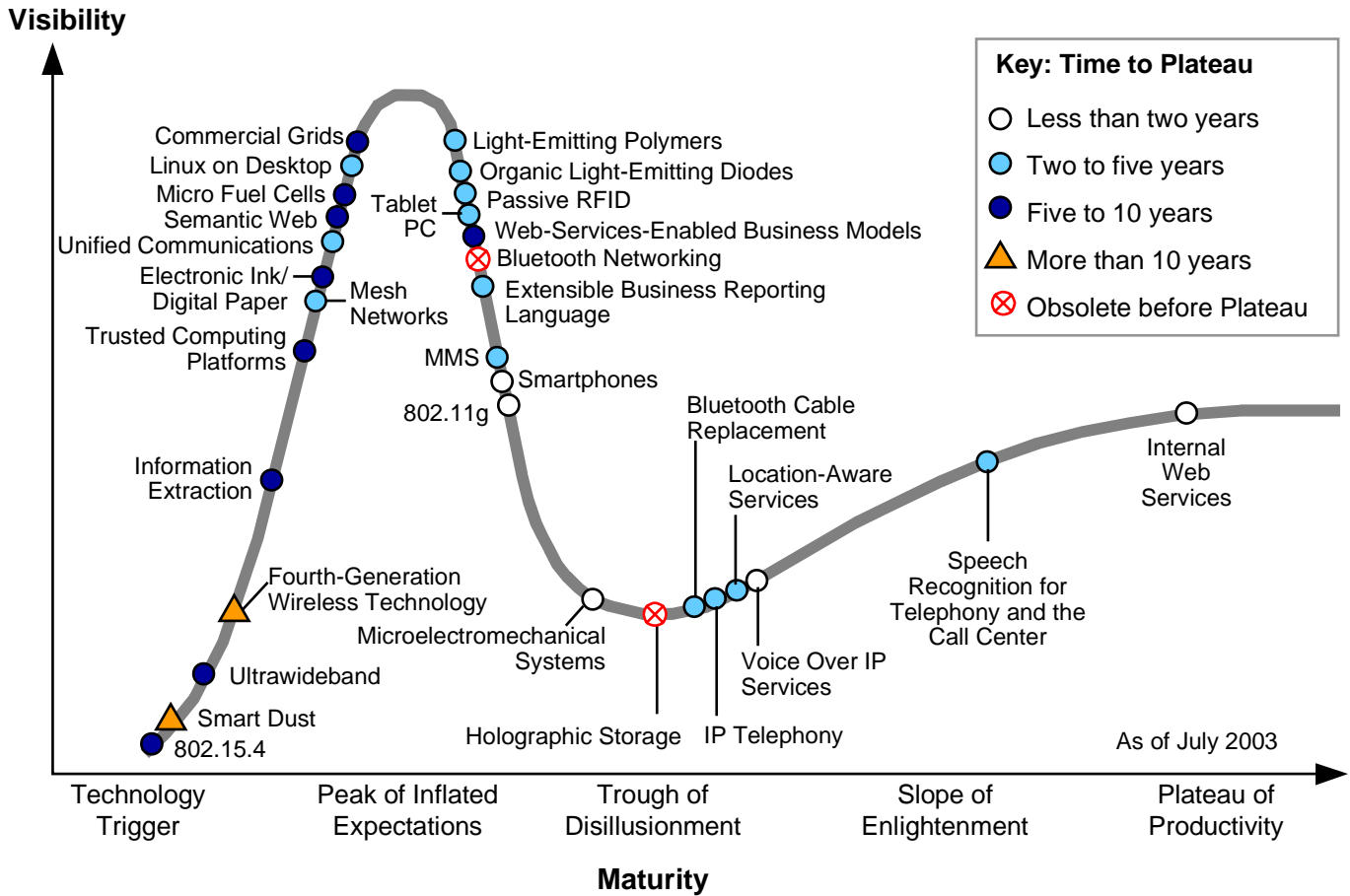
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# Hype Cycle for Emerging Technologies, 2003

# Hype Cycle for Emerging Technologies, 2003

## 1.0 The Hype Cycle



Source: Gartner Research (July 2003)

**Figure 1. Hype Cycle for Emerging Technologies, 2003**

## 2.0 On the Rise

### 2.1 802.15.4 (ZigBee)

*Definition:* 802.15.4 technology is low-rate, short-range wireless networking that offers long battery life for fixed devices. It is also known as the "ZigBee Alliance."

*Time to Plateau/Adoption Speed:* Five to 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* Specifications are not fully defined for 802.15.4 networking; there is little user awareness of the technology beyond industrial applications.

*Business Impact Areas:* Low-cost connectivity.

*Analysis by Phillip Redman*

# Hype Cycle for Emerging Technologies, 2003

## 2.2 Smart Dust

*Definition:* Smart dust refers to the use of electronic dust to create an airborne-based, ad hoc, mesh network infrastructure.

*Time to Plateau/Adoption Speed:* More than 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* Today, smart dust largely exists as theoretical ideas in academic and military areas.

*Business Impact Areas:* Additional and ad hoc network connectivity options, and ease of deployment.

*Analysis by Phillip Redman*

## 2.3 Ultrawideband

*Definition:* Ultrawideband technology is a personal-area network technology that uses pulsed radio techniques to transmit data. It is a possible high-bandwidth successor to Bluetooth.

*Time to Plateau/Adoption Speed:* Five to 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* Although regulatory issues are no longer in the way, product development and deployment has been slow.

*Business Impact Areas:* Higher-speed, low-cost network services.

*Analysis by Phillip Redman*

## 2.4 Fourth-Generation Wireless Technology

*Definition:* Fourth-generation (4G) wireless technology is a next-generation, wide-area technology that potentially offers high capacity to support "packetized" voice and more than 10-Mbps connection speeds.

*Time to Plateau/Adoption Speed:* More than 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* 4G wireless technology is still in early development; just the initial specification has been completed. Commercial rollouts of third-generation (3G) wireless technology have begun, with many iterations available. Development, then deployment, of 4G technology will be slow.

*Business Impact Areas:* High-speed communications, and multiple network and system interoperability.

*Analysis by Phillip Redman*

## 2.5 Information Extraction

*Definition:* Information extraction culls concepts such as names, geographical entities and relationships from unstructured data (mostly text).

*Time to Plateau/Adoption Speed:* Five to 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* Information extraction technologies have been offered commercially only recently. Most vendors are startups with limited traction, mainly in government and the life sciences.

*Business Impact Areas:* Information access, semantic Web, scientific literature and competitive intelligence.

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*Selected Vendors:* ClearForest, Inight Software, SRA International, Mohomine (recently acquired by Kofax), Microlanguage, Temis and IBM.

*Analysis by Alexander Linden*

### 2.6 Trusted Computing Platforms

*Definition:* The inclusion of secure operating systems and trusted hardware in PC and personal digital assistant platforms to support strong digital rights management and information protection.

*Time to Plateau/Adoption Speed:* Five to 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* Trusted computing will not be standard in shipped PC platforms until 2005, and it will not reach enough of the installed base to have major impact until 2008. Other platforms, such as cell phones and other consumer equipment, will penetrate after 2008.

*Business Impact Areas:* New business models enabled by digital rights management, safer use of public computers for employee remote access and stronger intellectual property protection.

*Selected Vendors:* Intel and Microsoft.

*Analysis by John Pescatore*

### 2.7 Mesh Networks

*Definition:* Mesh networks are developed from peer-to-peer routing technology. Packets can be routed around bottlenecks and failed nodes to maintain end-to-end connections.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* To date, there are few deployments of mesh networks; low corporate need exists for such technology.

*Business Impact Areas:* Improve connectivity options for remote access.

*Analysis by Phillip Redman*

### 2.8 Electronic Ink/Digital Paper

*Definition:* Digital paper resembles a sheet of plastic-laminated paper. Beneath the plastic are tiny microscopic beads that change color to form text and images. The result is a nearly paper-thin, rewritable display.

*Time to Plateau/Adoption Speed:* Five to 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* Improvements in cost and quality are required to drive this beyond early trials for signage. A number of significant relationships with mobile display manufacturers may support early commercialization during the next two to three years.

*Business Impact Areas:* Retail signage, low-power display for mobile devices and product packaging.

*Selected Vendors:* E Ink and Gyricon Media.

*Analysis by Jackie Fenn*

# Hype Cycle for Emerging Technologies, 2003

## 2.9 Unified Communications

*Definition:* Unified communications technology provides the ability to access people, content and collaboration tools, irrespective of access device or network protocol.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* Unified communications are part of the drive toward standards-based communications and information systems applications. The standards are still maturing and adoption remains strictly among Type A (aggressive technology adopter) enterprises.

*Business Impact Areas:* Communication and content access.

*Analysis by Drew Kraus and Bern Elliot*

## 2.10 Semantic Web

*Definition:* Extends the Web through semantic markup languages, such as the Resource Description Framework, OWL — the Web Ontology Language — and Topic Maps (see "Hype Cycle for XML Technologies, 2003," R-19-9727) that describe entities and their relationships (see "Innovative Approaches for Improving Information Supply," M-14-3517).

*Time to Plateau/Adoption Speed:* Five to 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* So far, there is little deployment of the semantic Web and there is a significant skill shortage.

*Business Impact Areas:* Information access, systems interoperability, database integration and data quality.

*Selected Vendors:* Network Inference, intelligent views, empolis, ontoprise, Mondeca and Ontopia.

*Analysis by Alexander Linden*

## 2.11 Micro Fuel Cells

*Definition:* An alternative power source to batteries for mobile devices. They have the potential to provide 10 times the energy of lithium ion batteries (see "Micro Fuel Cells Power Mobile Devices," T-18-6478).

*Time to Plateau/Adoption Speed:* Five to 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* Working prototypes are available. Large manufacturers are aiming for commercialization by 2005; others are partnering with device manufacturers.

*Business Impact Areas:* Equipment usage life. Facilitates more powerful mobile devices and applications.

*Selected Vendors:* Casio, NEC, Sony and Toshiba.

*Analysis by Rafe Ball and Jim Tully*

## 3.0 At the Peak

### 3.1 Linux on Desktop

*Definition:* Linux is a Unix-like, Posix-compliant operating system distributed under the GNU software license; the operating system and its source code are available for free.

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*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* The economic downturn, increasing cost of software, shrinking IT budgets and Microsoft pricing policies have made enterprises consider Linux on desktop.

*Business Impact Areas:* Limited availability of applications for general use. Migration and support costs are deterrents to wider acceptance.

*Selected Vendors:* MandrakeSoft, Red Hat, SuSE Linux and Turbolinux.

*Analysis by Lillian Tay*

### 3.2 Commercial Grids

*Definition:* Grid formed for nonscientific, nontechnical tasks across multiple enterprises to address a single, large-scale purpose. Grids can also be used within one enterprise. The term "grid" is sometimes misused to denote the related technologies of distributed and utility computing.

*Time to Plateau/Adoption Speed:* Five to 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* Growing movement by vendors to call products and long-term visions "grid." Confusion over definitions, benefits, maturity and applicability. Little is known about what commercial grid applications might be.

*Business Impact Areas:* New industry models could replace third-party intermediaries for large, multi-enterprise systems. Joint business opportunities with combined data warehouse and analytics. Distributed computing to increase efficiency and use of IT resources. Some claim grids will transform commercial IT operations.

*Selected Vendors:* Avaki, DataSynapse, IBM, Hewlett-Packard, Platform Computing, Sun Microsystems and Oracle.

*Analysis by Carl Claunch*

### 3.3 Light-Emitting Polymers

*Definition:* Light-emitting polymers (LEPs) are based on long-chain polymers that fluoresce when a current is applied. Using inkjet technologies, LEPs can be "printed" onto practically any substrate to form a display of light-emitting pixels.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* The technology of LEPs is still in development. The life of some colors is limited, making large-screen applications impractical.

*Business Impact Areas:* The potential for applications using ultra-thin, low-voltage and potentially flexible displays is enormous.

*Selected Vendors:* CDT Technologies and Philips Semiconductors.

*Analysis by Paul O'Donovan and Jim Tully*

## Hype Cycle for Emerging Technologies, 2003

### 3.4 Organic Light-Emitting Diodes

*Definition:* Organic light-emitting diodes (OLEDs) use short-chain molecules that are vacuum deposited onto a transparent substrate, such as glass. Applying low voltage across the matrix stimulates each pixel to transmit light. OLEDs require no backlight (unlike liquid crystal displays), so power consumption is low.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* Further development is required for longer-lasting colors and full-motion video.

*Business Impact Areas:* Low-voltage, full-color displays will have a significant impact in mobile electronics.

*Selected Vendors:* CTD Technologies and Philips Semiconductors.

*Analysis by Paul O'Donovan and Jim Tully*

### 3.5 Passive Radio Frequency Identification

*Definition:* Applied at the unit level, passive radio frequency identification (RFID) uses tags with data-storage capability to store manufacturing and product details. Passive tags do not require power, as they get their energy from the reader.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* RFID must first become cost-effective. Systems and standards must evolve to enable lower-cost deployments and overcome technical issues. Enterprises must develop best practices for business process redesign around RFID.

*Business Impact Areas:* Greater accuracy of supply chain information, improved product quality and customer service can be achieved.

*Selected Vendors:* Intermec Technologies.

*Analysis by Dan Miklovic and Jeff Woods.*

### 3.6 Tablet PC

*Definition:* Tablet PCs meet all of the criteria for a notebook PC, except that they are equipped with a pen and on-screen digitizer. Tablet PCs also have a removable keyboard or a rotating screen that can be positioned on the outside when the lid is closed. Tablet PCs run Microsoft Windows XP Pro Tablet Edition.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* Tablet PCs have four barriers to overcome: lack of operating system integration, lack of applications support, ergonomics and price. All should be addressed by 2005.

*Business Impact Areas:* Useful today in vertical applications for clipboard replacement. Use of a pen will eventually become a natural, additional input mode for horizontal use.

*Selected Vendors:* Most international PC vendors have released their Tablet PC versions as of first-quarter 2003, except Dell Computer and IBM.

*Analysis by Frederique Makharine and Leslie Fiering*

# Hype Cycle for Emerging Technologies, 2003

## 3.7 Web-Services-Enabled Business Models

*Definition:* New approaches for doing business that would not have been possible without the benefits of Web services.

*Time to Plateau/Adoption Speed:* Five to 10 years.

*Justification for Hype Cycle Position/Adoption Speed:* Enterprises are learning that the efficiency they expect from Web services comes with significant investment in general collaboration on standard definitions, schemas and processes.

*Business Impact Areas:* Web services will make business opportunities less costly to achieve.

*Analysis by Whit Andrews*

## 4.0 Sliding Into the Trough

### 4.1 Bluetooth Networking

*Definition:* Bluetooth networking uses short-range Bluetooth technology for personal- or local-area access to the Internet, or pairing with multiple users in immediate range.

*Time to Plateau/Adoption Speed:* Obsolete before Plateau.

*Justification for Hype Cycle Position/Adoption Speed:* Bluetooth networking has limited use and capability for networking at a low cost; the more robust Wi-Fi (Wireless Fidelity) technology is widely available.

*Business Impact Areas:* Productivity and real-time collaboration.

*Analysis by Phillip Redman*

### 4.2 Extensible Business Reporting Language

*Definition:* Extensible Business Reporting Language (XBRL) is an XML-defined standard for exchanging, analyzing and reporting financial information (see "Implications of the FDIC's Call Report Initiative," QA-15-9439, and "The Impact of BAM on Financial Services Users," SPA-15-2703). As such, it involves the accounting industry, investors, public and private companies, and government regulatory agencies.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* Regulators are adopting XBRL and may dictate that enterprises use it for reporting purposes. A strong international membership is involved in its development. XBRL-aware products are developed in-house (for example, by financial firms). Despite interest, XBRL has not had broad adoption by accounting firms, and generally available software has not been developed.

*Business Impact Areas:* Improve interoperability, enable data verification and integration with back-end systems. Fulfilling multiple public and reporting needs through a single source/posting of financial data. Automate sourcing and review of financial data for activities such as loan acceptances and risk reviews.

*Selected Vendors:* EDGAR Online, Fujitsu, Microsoft, Software AG and many financial institutions (Fidelity Investments, JP Morgan and Dresdner Kleinwort Benson).

*Analysis by Mary Knox and Rita Knox*

## Hype Cycle for Emerging Technologies, 2003

### 4.3 Multimedia Messaging Service

*Definition:* Multimedia Messaging Service (MMS) is a new mobile messaging standard that offers multimedia services for phone-to-phone transmission.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* The MMS standard has enabled vendors to create some early products that have regional availability. However, MMS is not supported on all mobile phones and there is little early market awareness.

*Business Impact Areas:* Productivity and real-time collaboration.

*Analysis by Phillip Redman*

### 4.4 Smartphones

*Definition:* A smartphone is a mobile terminal that can send and receive voice and data calls. Although a smartphone is voice-centric, it can run data applications without a network connection.

*Time to Plateau/Adoption Speed:* Less than two years.

*Justification for Hype Cycle Position/Adoption Speed:* Early smartphone products were costly and haven't been widely adopted. More devices are coming soon.

*Business Impact Areas:* Anytime, anywhere computing.

*Analysis by Ken Dulaney*

### 4.5 802.11g

*Definition:* 802.11g is an alternative wireless LAN technology to 802.11b. It has enhanced performance features. 802.11g operates at 2.4GHz and can deliver up to a 54-Mbps link rate.

*Time to Plateau/Adoption Speed:* Less than two years.

*Justification for Hype Cycle Position/Adoption Speed:* 802.11g will deliver additional bandwidth to meet the needs of new applications.

*Business Impact Areas:* Mobility and convenience, real-time collaboration and wireline replacement.

*Analysis by Ken Dulaney*

### 4.6 Microelectromechanical Systems

*Definition:* Semiconductor devices incorporating structures that can physically move, in addition to electronic circuits.

*Time to Plateau/Adoption Speed:* Less than two years.

*Justification for Hype Cycle Position/Adoption Speed:* Some applications are already in widespread use (for example, airbag accelerometers, inkjet nozzles).

*Business Impact Areas:* High impact across a wide range of applications. Has significant, long-term impact for biomedical applications.

*Analysis by Jim Tully*

# Hype Cycle for Emerging Technologies, 2003

## 4.7 Holographic Storage

*Definition:* Holography allows writing and reference laser beams to store data in densely latticed patterns scattered throughout an optically sensitive medium.

*Time to Plateau/Adoption Speed:* Obsolete before Plateau.

*Justification for Hype Cycle Position/Adoption Speed:* A working, manufacturable prototype smaller than a refrigerator and costing less than millions of dollars has yet to be produced.

*Business Impact Areas:* No impact. This technology's time is never likely to come. Some vendors are engaged in research, but they have not produced marketable products.

*Analysis by John Monroe*

## 5.0 Climbing the Slope

### 5.1 Bluetooth Cable Replacement

*Definition:* Bluetooth cable replacement technology is a standardized personal-area-network technology (with a range of up to 10 meters) that operates at 2.4GHz and is used for connecting devices together in a peer-to-peer network.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* Hardware and software providers will create de facto standards around a subset of the currently defined Bluetooth application profiles.

*Business Impact Areas:* Reduce costs for categories of products such as mice, keyboards and automotive applications.

*Analysis by William Clark*

### 5.2 IP Telephony

*Definition:* IP telephony is used in applications that provide telephony services, which were previously delivered via a private branch exchange (PBX) or Centrex to IP telephones or "softphones."

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* IP telephony products are shipping to enterprises, but a lack of a clear business case for "forklift" upgrades of PBXs is restricting the market.

*Business Impact Areas:* New applications, capabilities and business processes.

*Analysis by Bob Hafner and Ian Keene*

### 5.3 Location-Aware Services

*Definition:* Location-aware services use cellular network technology to provide services that are relevant to a specific user location. Services include safety, information and tracking.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* Location-aware service integration into applications began in 2002. A critical mass of network and device support will occur through 2008. Privacy is a significant hurdle.

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*Business Impact Areas:* Productivity and real-time collaboration.

*Analysis by William Clark*

### **5.4 Voice Over IP Services**

*Definition:* Voice over IP services put voice traffic into packets for transport over an IP network.

*Time to Plateau/Adoption Speed:* Less than two years.

*Justification for Hype Cycle Position/Adoption Speed:* Carriers continue to "packetize" voice traffic.

*Business Impact Areas:* Lower-cost services.

*Analysis by Bob Hafner and Ian Keene*

## **6.0 Entering the Plateau**

### **6.1 Speech Recognition for Telephony and the Call Center**

*Definition:* Speech-recognition systems interpret human speech and translate it into text or commands. Telephony and call center applications allow automation of tasks through a speech recognition dialogue with the caller.

*Time to Plateau/Adoption Speed:* Two to five years.

*Justification for Hype Cycle Position/Adoption Speed:* Adoption of speech recognition for the call center is moving beyond early adopters and gaining acceptance as a viable automation tool. The need for careful application selection and design is causing slower adoption than for other self-service approaches (for example, the Web).

*Business Impact Areas:* Travel reservations, order status, ticketing, stock trading, directory services, auto attendants and name dialing.

*Selected Vendors:* Nuance, SpeechWorks and IBM.

*Analysis by Jackie Fenn*

### **6.2 Internal Web Services**

*Definition:* The use of Web services inside enterprise security perimeters to accomplish noninvasive integration.

*Time to Plateau/Adoption Speed:* Less than two years.

*Justification for Hype Cycle Position/Adoption Speed:* Most case studies include these approaches.

*Business Impact Areas:* Business intelligence.

*Analysis by Whit Andrews*

## **7.0 Conclusion**

All maturity assessments have been done generically, without addressing industry variations. IT planners typically should consider the technology and application Hype Cycles as generalizations and good starting points for their industries. In addition, we have produced some vertical-industry-specific Hype Cycles:

"Hype Cycle for Financial Services Technologies, 2003" (R-20-1555)

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"Hype Cycle for Government Technologies, 2003" (R-20-2034)

"Hype Cycle for Healthcare Payer Organization Technologies, 2003" (R-20-1557)

"Hype Cycle for Healthcare Provider Technologies, 2003" (R-20-1556)

"Hype Cycle for Life Sciences Technologies, 2003" (R-20-1551)

"Hype Cycle for Manufacturing Technologies, 2003" (R-20-1554)

"Hype Cycle for Retail Technologies, 2003" (R-20-1559)

"Hype Cycle for Transportation Technologies, 2003" (R-20-1558)

"Hype Cycle for Utility Technologies, 2003" (R-20-0834)

# Hype Cycle for Emerging Technologies, 2003

## Appendix A: Hype Cycle Definitions

*Technology Trigger:* A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.

*Peak of Inflated Expectations:* During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the technology is pushed to its limits. The only enterprises making money are conference organizers and magazine publishers.

*Trough of Disillusionment:* Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.

*Slope of Enlightenment:* Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits. Commercial, off-the-shelf methodologies and tools ease the development process.

*Plateau of Productivity:* The real-world benefits of the technology are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. The final height of the plateau varies according to whether the technology is broadly applicable or benefits only a niche market. Approximately 30 percent of the technology's target audience has or is adopting the technology as it enters the Plateau.

*Time to Plateau/Adoption Speed:* The time required for the technology to reach the Plateau of Productivity.

## Hype Cycle for Emerging Technologies, 2003

### Appendix B: Acronym Key

<b>3G</b>	third generation
<b>4G</b>	fourth generation
<b>LEP</b>	light-emitting polymer
<b>MMS</b>	Multimedia Messaging Service
<b>OLED</b>	organic light-emitting diode
<b>PBX</b>	private branch exchange
<b>RFID</b>	radio frequency identification
<b>XBRL</b>	Extensible Business Reporting Language