



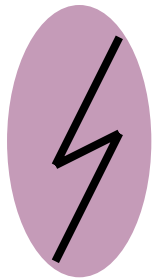
XIII Century



XIII Century - Montsegur - Languedoc

Intelligence in Artificial Wireless (or Death of the Washing Machine)

Bertrand du Castel
Schlumberger



Invited Presentation

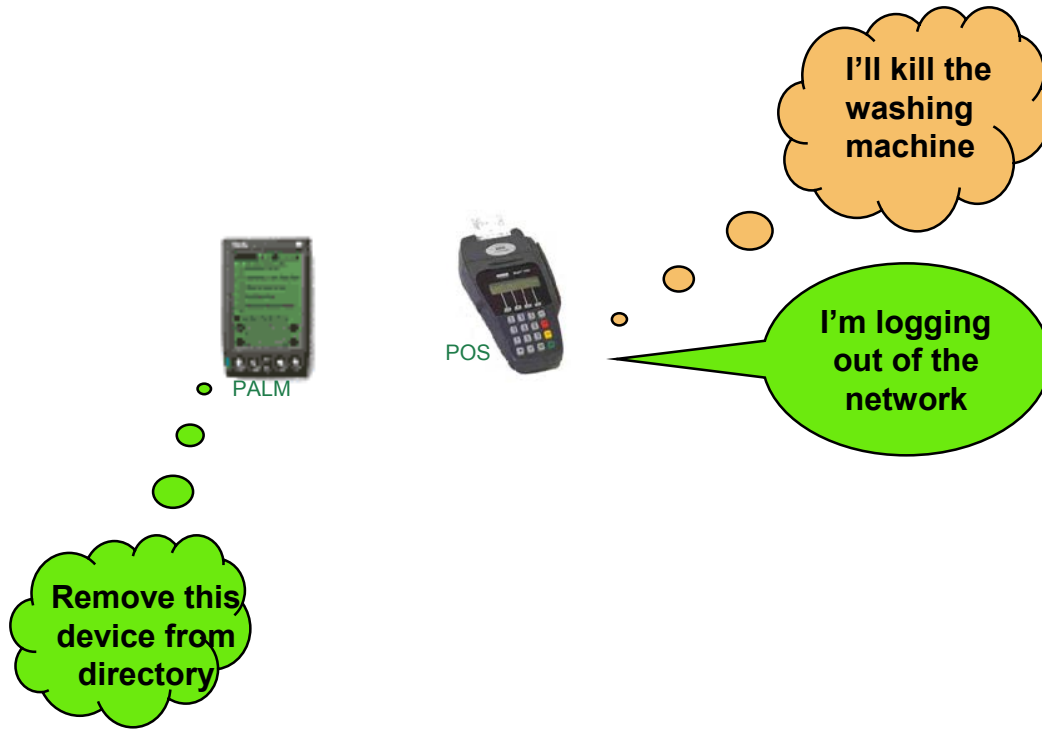
American Association for Artificial Intelligence - Austin, Texas, August 2000
Updated February 9, 2001 for the University of Maryland, Baltimore County
AetherSystems Distinguished Lecture Series in Mobile and Wireless Systems

Natural wireless

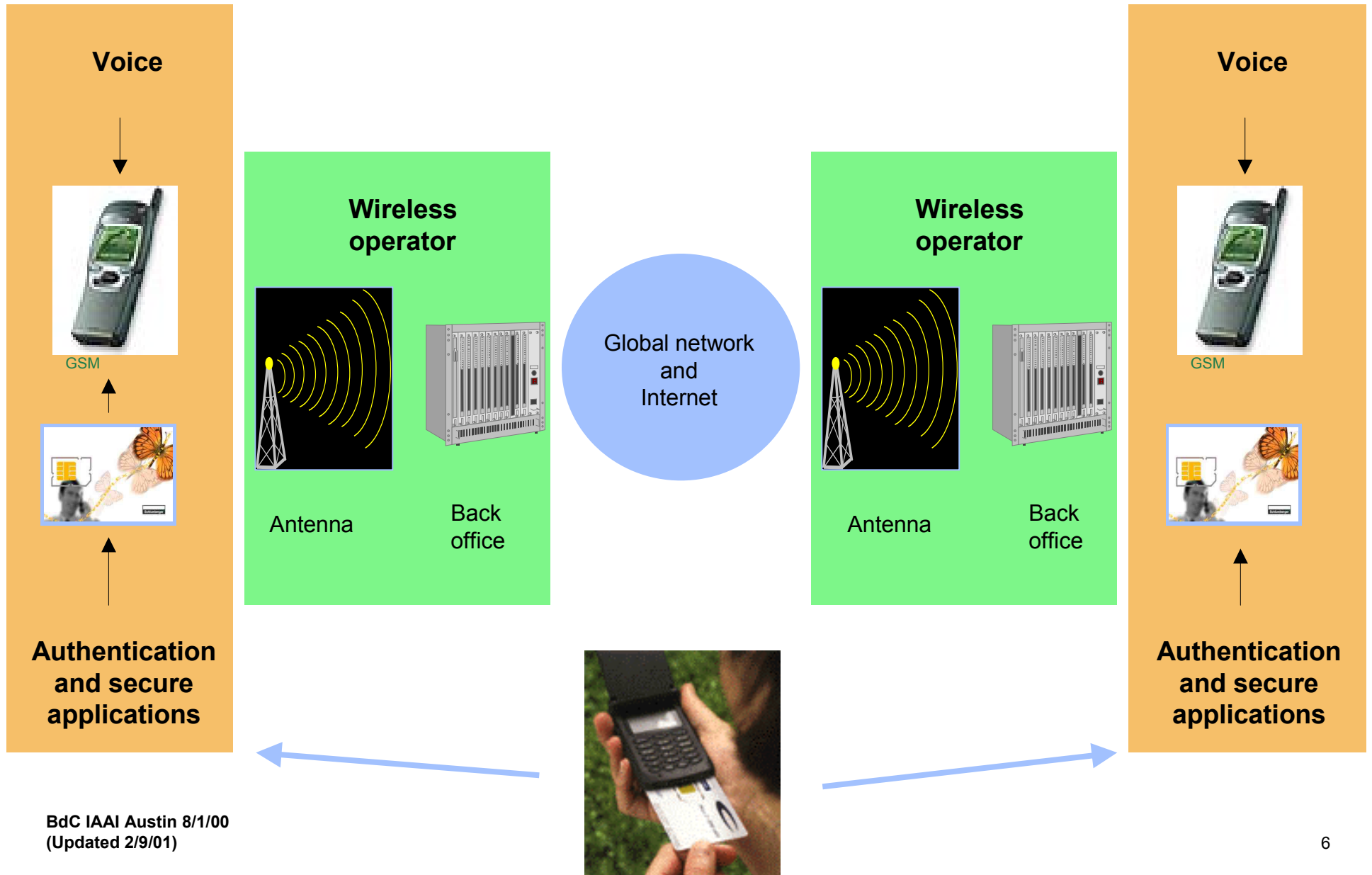


Phatic communication
(Roman Jakobson)

Artificial wireless

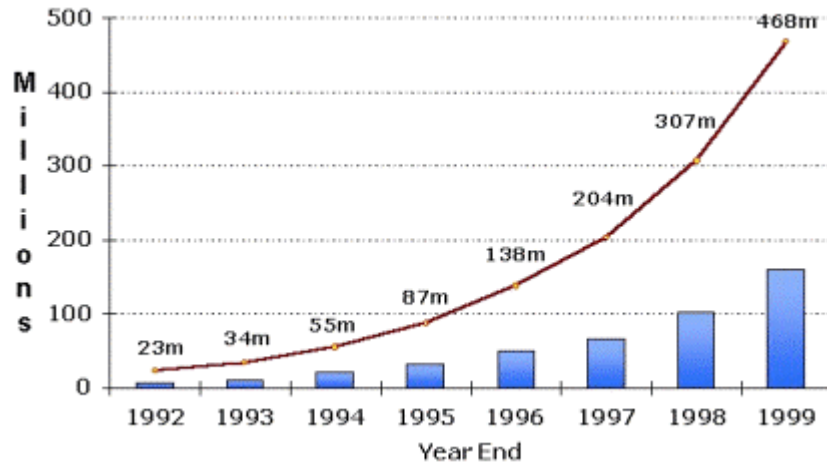


What 's a phone (circa 2000)

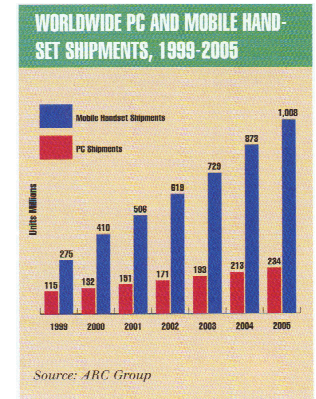


Who's on the Internet

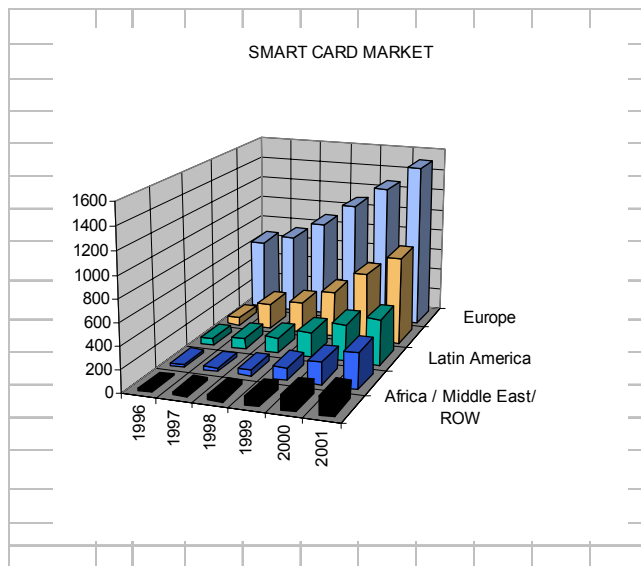
GSM Phones Subscribers Source: [EMC World Cellular Database.](#)



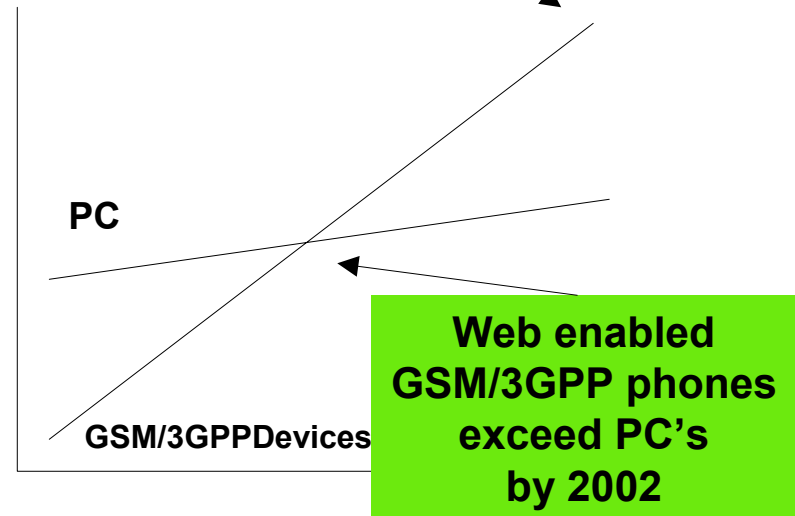
GSM/3GPP vs PC shipments



Two billion wireless Internet devices by 2005



Sales of smart cards



Web enabled GSM/3GPP phones exceed PC's by 2002

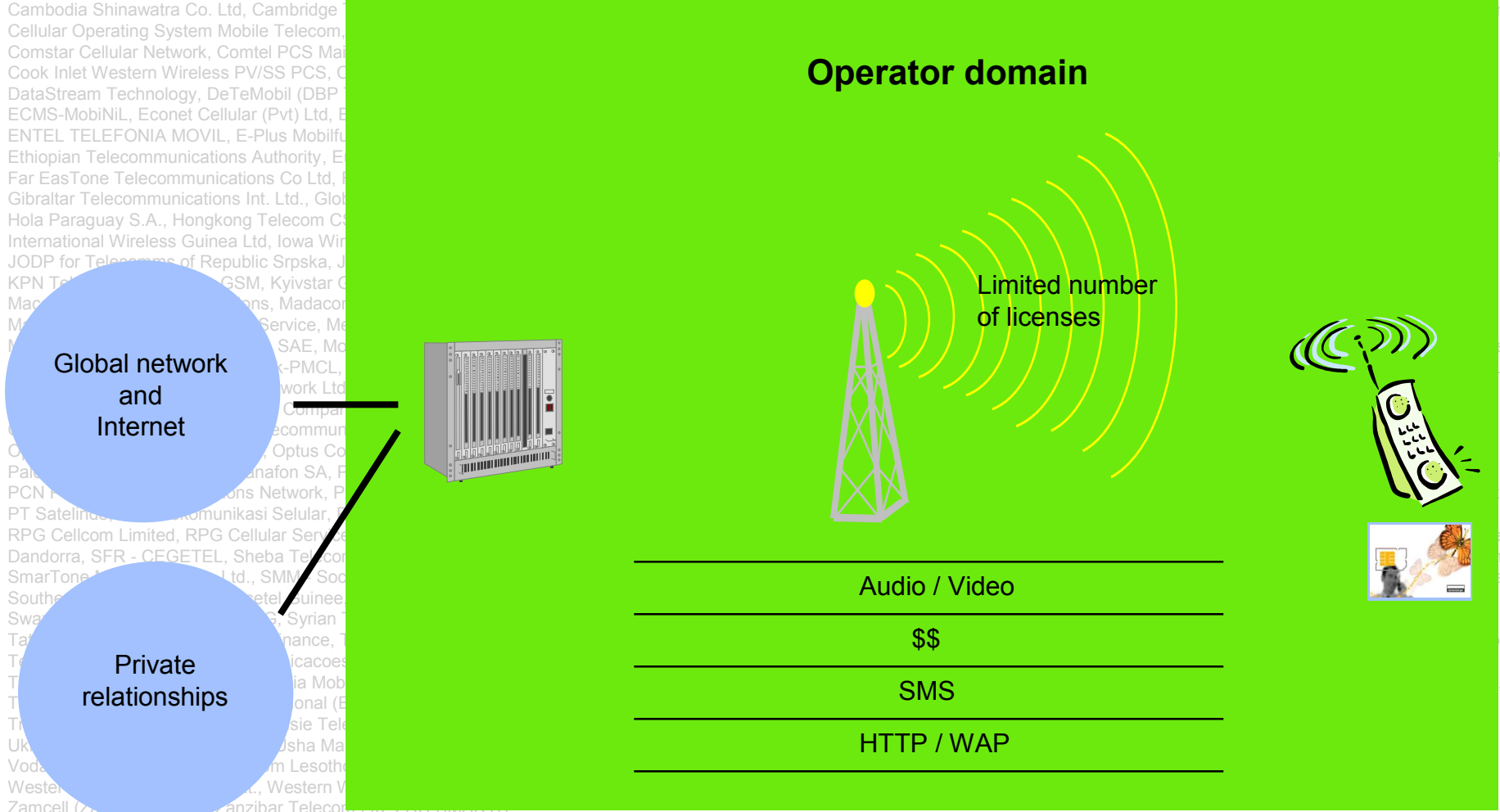
Who would control the Internet

Advanced Info Service PLC, Aerial Operating Company, Airadigm Communications, Aircel Digilink India Ltd, Airtel, Alands Mobiltelefon Ab, Albanian Mobile Communications, American Personal Comm., American Samoa Telecom LLC, ArmenTel, Azercell Telecom BM, Baltcom GSM, BATELCO, Baykalwestcom, Belgacom Mobile, BellSouth Mobility DCS, Ben Nederland BV, Bharti Cellular Ltd, Bharti Telenet Ltd, Binariani Communications Sdn Bhd, Birla AT&T Communications Ltd, Bitel Ltd, BM Telecom Ltd., Bouygues Telecom, BPL Mobile Communications Ltd, BPL USWEST Cellular, BTCCellnet, Buztel, Cable & Wireless (Seychelles), Cabo Verde Telecom, Cambodia Smart Communication Co Ltd, Cambodia Shinawatra Co. Ltd, Cambridge Telephone Company, CamGSM, Carolina PCS I Limited Partnership, Celcom Iran, Celcom/Cellular Comms. Network, Cellplus Mobile Communications Ltd., Cellular Operating System Mobile Telecom, CelTel, China Telecom, China Unicom, ChungHwa Telecom LDM, Communications Investments Ltd, Communications Venture Corporation, Comstar Cellular Network, Comtel PCS Mainstreet Ltd Partnership, COMVIC GSM AB, Conestoga Wireless Company, Congolaise Wireless Network, Connect Austria, Consorcio Elca C.A., Cook Inlet Western Wireless PV/SS PCS, COPESA (Comunicaciones Personales S.A., Corporacion Digital C.A., Coscom, CTM, Cyprus Telecommunications Auth, Daewoo Central Paging Co, DataStream Technology, DeTeMobil (DBP Telekom), diAx Mobile AG, Digi Telecommunications Sdn Bhd, DigiPH, Digital Phone Co Ltd, Digital Spacetel Srpska, DonTeleCom, Dutchtone N.V., ECMS-MobiNIL, Econet Cellular (Pvt) Ltd, Eircell, EL MADAR Telecomm Company, Electronic Application Est- AlJawwal, Emirates Telecom Corp-ETISALAT, ENTEL PCS, ENTEL TELEFONIA MOVIL, E-Plus Mobilfunk, Ermak RMS, Eronet Mobile Communications Ltd, Esat DigiFone, Escotel Mobile Communications, Estonian Mobil Telephone Co, Ethiopian Telecommunications Authority, Europolitan AB, EuroTel Bratislava as, Eurotel Praha Ltd, Evergrowth Telecom, Excelcom, Xtel Mobile Com. System, Far Eastern Cellular Systems - 900, Far EastTone Telecommunications Co Ltd, Faroese Telecom, Fascel Limited, Finnet Group, France Caraibe Mobiles, France Telecom Mobile, FTML, Geocell Ltd, Gibraltar Telecommunications Int. Ltd., Globe Telecom, Globtel GSM as, Golden Telecom LLC, GrameenPhone Ltd, GSM Kazakhstan Ltd, Guernsey Telecoms, Hexacom India Ltd, Hola Paraguay S.A., Hongkong Telecom CSL, HPT Croatia P & T, Hutchison Max Telecom PVT Ltd, Hutchison Telecom (HK) Ltd, IAM, Iceland Telecom, Infonet Redes de Informacion CA, International Wireless Guinea Ltd, Isla Wireless Services, LP, Iridium LLC, Isla Communications Co. Inc., J T Mobiles Ltd, J.V. Bakcell, Jersey Telecommunications, JMITS, JODP for Telecomms of Republic of Slovakia, JSC Telecom XXI, Kar-Tel Ltd, KB Impuls, Kenya Posts & Telecoms Corp, KG Telecom, KIFZO, Koshika Telecom Ltd, KPN Orange Belgium NV, KPN Telecom B.V., Kuban-GSM, Kustar GSM JSC, Kyivstar GSM JSC, Lao Shinawatra Telecom, Latvian Mobile Telephone Co, LibanCell, Libertel, Lotus Telecom, Macedonian Telecommunications, Madacom SA, Magtic GSM, Mandarin Communications Ltd, Mannesmann Mobilfunk GmbH, Manx Telecom, Mascom Wireless (Pty) Limited, Max Mobil Telecommunications Service, Message Express Company, Microcell Telecommunications Inc, Millicom Luxembourg S.A., Ministry of Post & Telecommunications, Misfone Telecommunications Co. S.A., MobilCom, Mobifon SA, Mobil Rom, Mobile Communications Systems, Mobile Digital Communications, Mobily Telecommunications, Mobile TeleSystems (MTS), MobileOne (Asia) Pte. Ltd, Mobilnet AG, Mobilix, Mobilkom Austria AG, MobilTel AP, Mobistar S.A., MobiTai, Mobitel, Mobitel D.D., Modi Telstra, MTS Telecom Network Private Ltd, Motophone Limited, MTC, MTN - Mobile Telephone Network Ltd., MTN Networks (Private) Limited, MTN Uganda Ltd, National Mobile Communications Company, Nepal Telecom, Nepal Telecoms Corporation, NetCom GSM AS, New Telephone Company, New World PCS, Nizhegorodskaya Cellular Communications, North-West GSM, NPI Wireless, Office de Telecommunications de la Reunion, Office des Telecommunications, Oman Telecommunications Company, Omega Communications Inc, Omnipoint Corporation, OMNITEL, Omnitel Pronto Italia, Omnitel 2-One, OPT New Caledonia, Optimus Telecomunicacoes S.A., Opus Communications, Orange Communications SA, Orange PCS Ltd, Oy Radiolinja Ab, P & T Luxembourg, Pacific Telecommunications, Palestine Telecomm Co Ltd, Pannor SA, Panhandle Telecommunication Systems Inc., Pannon GSM Telecommunications, Partner Communications Company Ltd, PCN Personal Communication Network, PCS One Inc, Peoples Telephone Company Ltd, Polkomtel S.A., Polska Telefonia Cyfrowa, Posts & Telecommunications, Powertel PCS Inc, ProMonte GSM, PT Satelindo, PT Telekomunikasi Selular, PTK Centertel, Public Enterprise PTT BiH, Q-Tel, Radiolinja Estonia Ltd, RadioMobil, Reliance Telecom P, RTPG Cellcom Limited, RPG Cellular Services, Rwandacell SARL, Sacel Madagascar, Saudi Telecom Company (STC), SBC Communications Inc., Scom, Senegal Telecom, SENTEL GSM S.A., Servei De Tele. Dandorra, SFR - CEGETEL, Sphera Telecom (PVT) Ltd., SI.MOBIL d.d., Siberian Cellular Systems 900, Singapore Telecom Mobile Pte Ltd, SkyCell Communications Ltd, Smart Communications, SmartOne Ltd, SmarTone Mobile Comms. Ltd., SMM - Societe Malgache de Mobiles, Societe Ivoirienne De Mobiles (SIM), Societe Reunionnaise de Radiotelephone, Sonater, Sonera Ltd, Sonofon, Sotelgui sa, Southeast Telephone Inc, Spacetel Cellular, Srinivas Cellcom Limited, StarHub Pte Ltd, StavTelesot, Sterling Cellular Ltd (SCL), STET Hellas Telecommunications, STPCS Joint Venture LLC, Swazi MTN Limited, Swisscom, Syrian Telecommunication Est., Taiwan Cellular Corporation, TAL hf., Tambovskaya Electrosvyaz, TATA Communications Ltd, Tatar-American Investments and Finance, TCI, Tele Danmark A/S, TELE Greenland A/S, Telecel, Telecel (Zambia) Ltd, Telecel Guinee SARL, Telecel Zimbabwe (PVT) Ltd, Telecom Italia Mobile, Telecom Seychelles Ltd, Telecomunicacoes de Mocambique, Telefonica Moviles, Telekom Cellular Sdn Bhd (TMTOUCH), Telekom Network Ltd, Telekom Srbija, Telenor Mobil, Telfort Holding N.V., Telia A/S Denmark, Telia Mobile, Telia Mobile AB Branch in Finland, Telsim Mobil Telekomunikasyon Hizmetleri, Telstra Corporation Limited, Third Kentucky Cellular Corporation, Tikiphone SA, Time Wireless Sdn Bhd, TM International (Bangladesh) Ltd, TMN, Togo Telecom, Tomsk Cellular Communication, Total Access Communications Co, TransAsia Telecommunications, Tri Telecommunication (T) Ltd., Tunisie Telecom, Tuntex Telecom, Turkcell Iletisim Hizmetleri A.S., UAB Bite GSM, Udmurtia Digital Networks - 900, Ukrainian Mobile Communications, Ukrainian Radio Systems, Uraltel, Usha Martin Telekom Ltd, Uzmacom, VIAG Interkom, Vietnam Posts & Telecommunications Corp, VIP-NET GSM d.o.o, VISTA Cellular Pty (Ltd), Vodacom Group Pty Ltd., Vodacom Lesotho (Pty) Ltd, Vodafone Fiji Ltd, VODAFONE Ltd, Vodafone Malta Limited, Vodafone Mobile NZ Limited, Vodafone Pty Limited, VoXtel S.A., Westel 900 Mobil Tavkozlesi Rt., Western Wireless Corporation, Wind Telecomunicazioni SpA, Wireless Com. Services Co. (WCS), Wireless Telecommunications Company, Yeniseytelecom, Zamcell (Zambia) Limited, Zanzibar Telecom Ltd, ZAO SMARTS

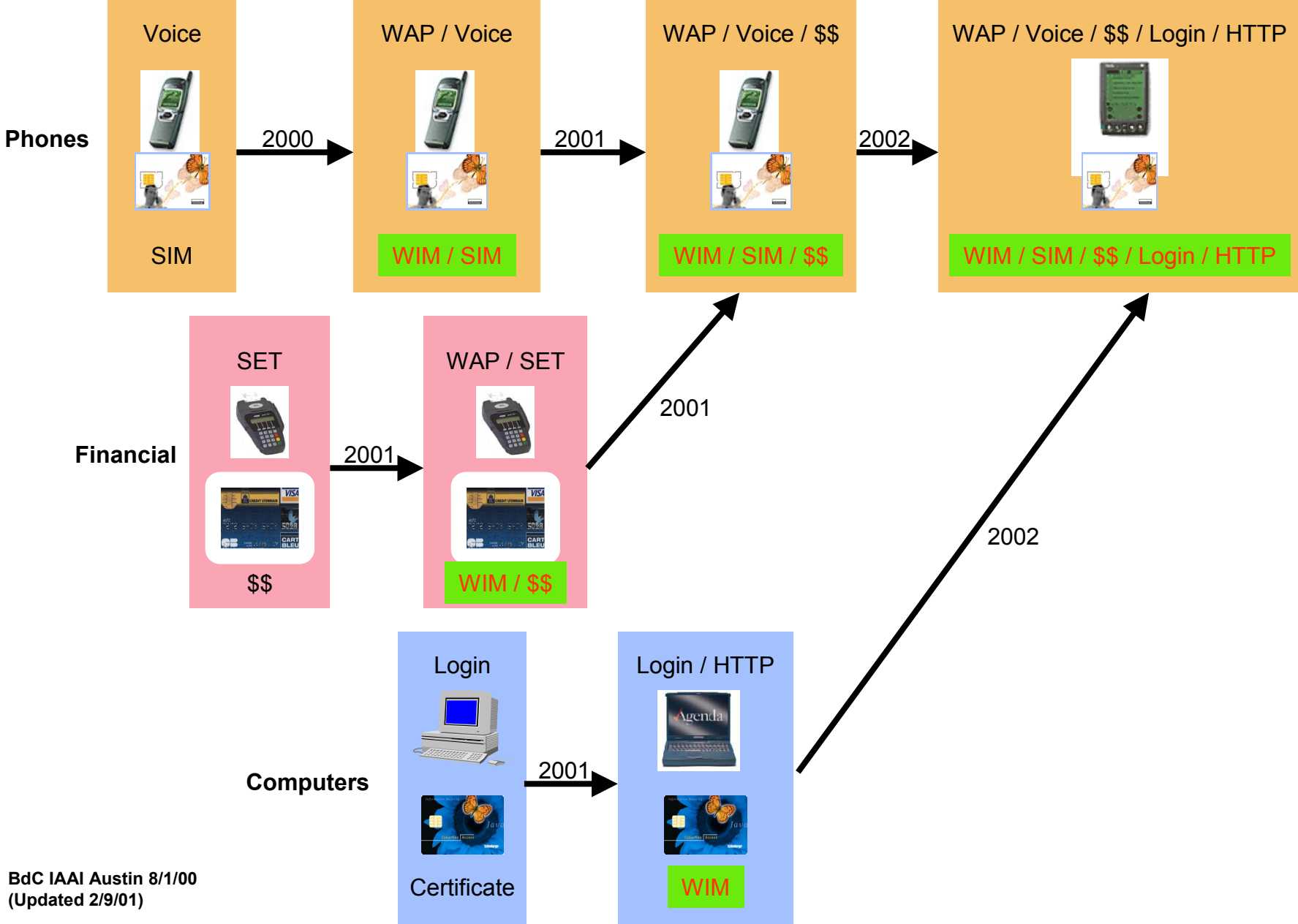


GSM/3GPP Operators would control the Internet

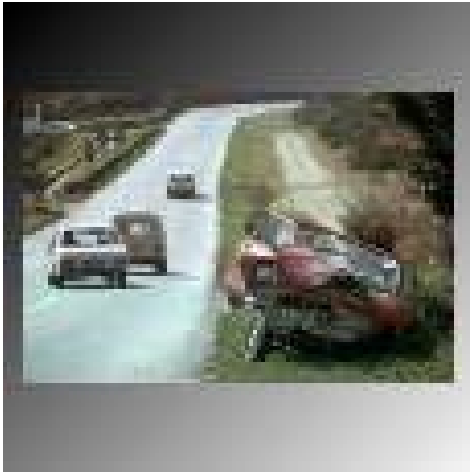
Advanced Info Service PLC, Aerial Operating Company, Airadigm Communications, Aircel Digilink India Ltd, Airtel, Alands Mobiltelefon Ab, Albanian Mobile Communications, American Personal Comm., American Samoa Telecom LLC, ArmenTel, Azercell Telecom BM, Baltcom GSM, BATELCO, Baykalwestcom, Belgacom Mobile, BellSouth Mobility DCS, Ben Nederland BV, Bharti Cellular Ltd, Bharti Telenet Ltd, Binariang Communications Sdn, Birla AT&T Communications Ltd, Bitel Ltd, BM Telecom Ltd., Bouygues Telecom, BPL Mobile Communications Ltd, BPL USWEST Cellular, BTCCellnet, Buztel, Cable & Wireless (Seychelles), Cabo Verde Telecom, Cambodia Samart Communication Co Ltd, Cambodia Shinawatra Co. Ltd, Cambridge Cellular Operating System Mobile Telecom, Comstar Cellular Network, Comtel PCS Mail, Cook Inlet Western Wireless PV/SS PCS, C DataStream Technology, DeTeMobil (DBP ECMS-MobiNiL, Econet Cellular (Pvt) Ltd, ENTEL TELEFONIA MOVIL, E-Plus Mobilfu Ethiopian Telecommunications Authority, E Far EastTone Telecommunications Co Ltd, Gibraltar Telecommunications Int. Ltd., Glos Holo Paraguay S.A., Hongkong Telecom C International Wireless Guinea Ltd, Iowa W JODP for Telecomms of Republic Srpska, KPN Tel GSM, Kyivstar C Macadons, Madacor M Service, Me SAE, Mo k-PMCL, work Ltd Company ecommun Optus Co anafon SA, F PCN P ons Network, P PT Satelindo, komunikasi Selular, RPG Cellcom Limited, RPG Cellular Service Dandorra, SFR - CEGETEL, Sheba Telecom SmarTone Ltd., SMM/ Soc Southe etel Guinee Swa, Syrian T Ta nance, T Te icacoes T ia Mob T onal (E T ssie Tele UK osha Ma Vod m Lesotho Westel, Western V Zamcell (Zanzibar Telecom Ltd, ZTC SmartTel



Reign of the phone



Death of the phone (circa 2001)



BdC IAAI Austin 8/1/00
(Updated 2/9/01)

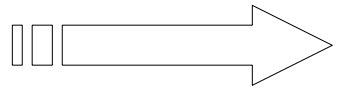
What 's a phone (circa 2002)



Sybersay \$100
Comdex 11/00

GSM

2000



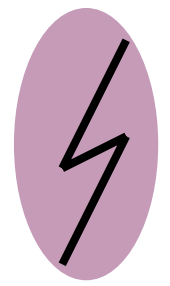
Both Speaker and Microphone

Bluetooth Short Range Wireless protocol

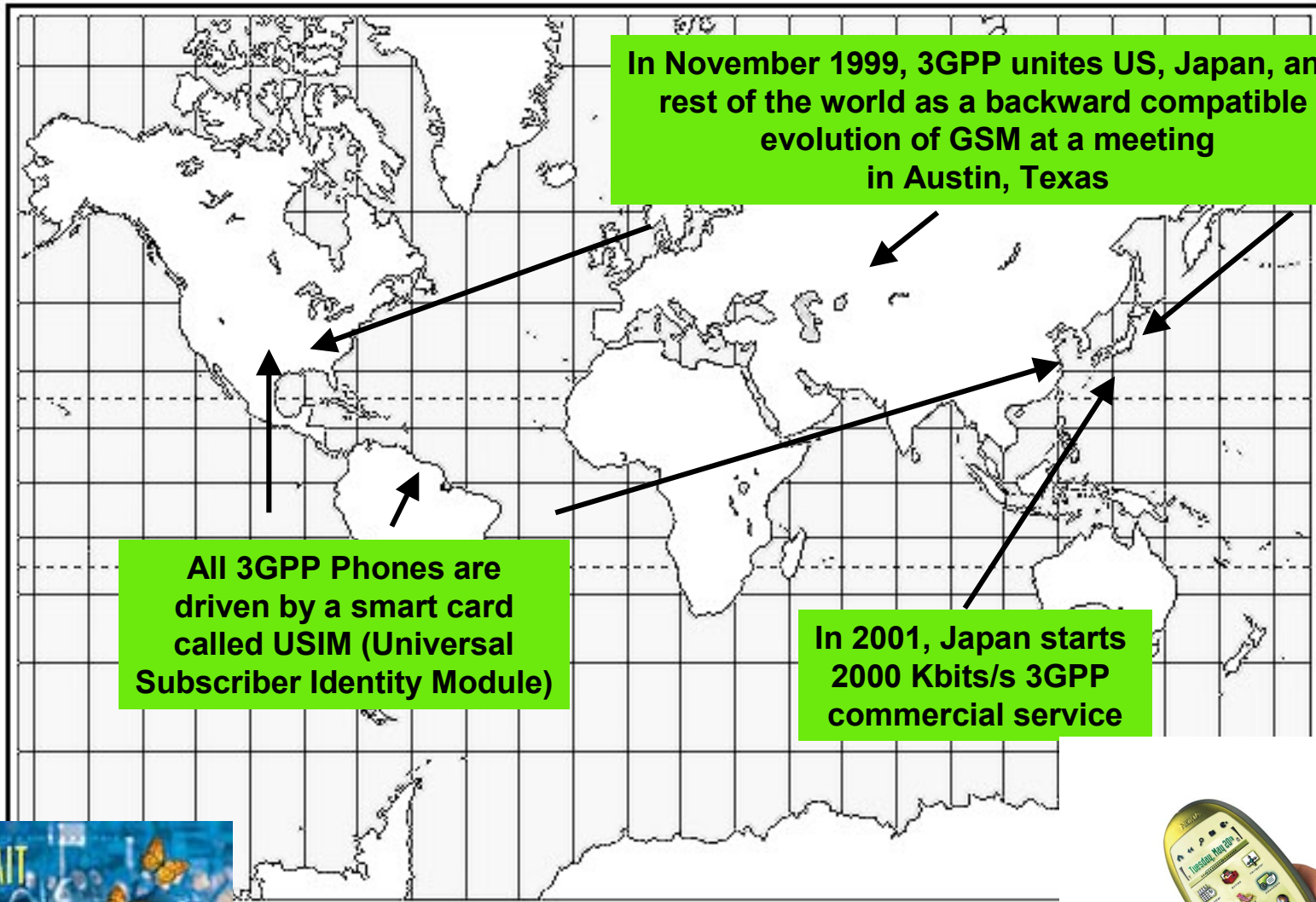
GSM/3GPP Long Range Wireless protocol

PALM

2002



3rd Generation Portable Phones



In November 1999, 3GPP unites US, Japan, and rest of the world as a backward compatible evolution of GSM at a meeting in Austin, Texas

All 3GPP Phones are driven by a smart card called USIM (Universal Subscriber Identity Module)

In 2001, Japan starts 2000 Kbits/s 3GPP commercial service



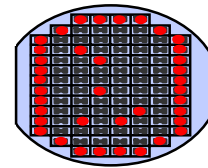
1 Billion in 2005



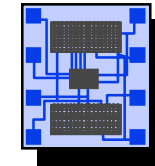
Core of the phone: what's a smart card



Year 2000	
CPU	15 MHz
RAM	2K KB
ROM	32 KB
EEPROM	32 KB
1024 RSA	500 ms



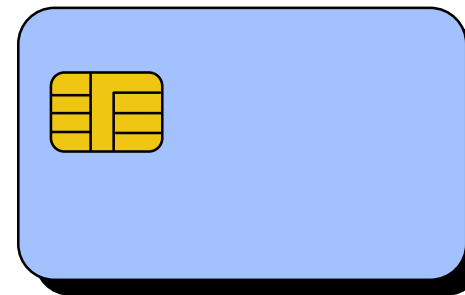
SGS Thomson,
Infineon,
Philips, Atmel, Hitachi



**Core chip size
25 Sq Millimeters**



**Module
(contact)**

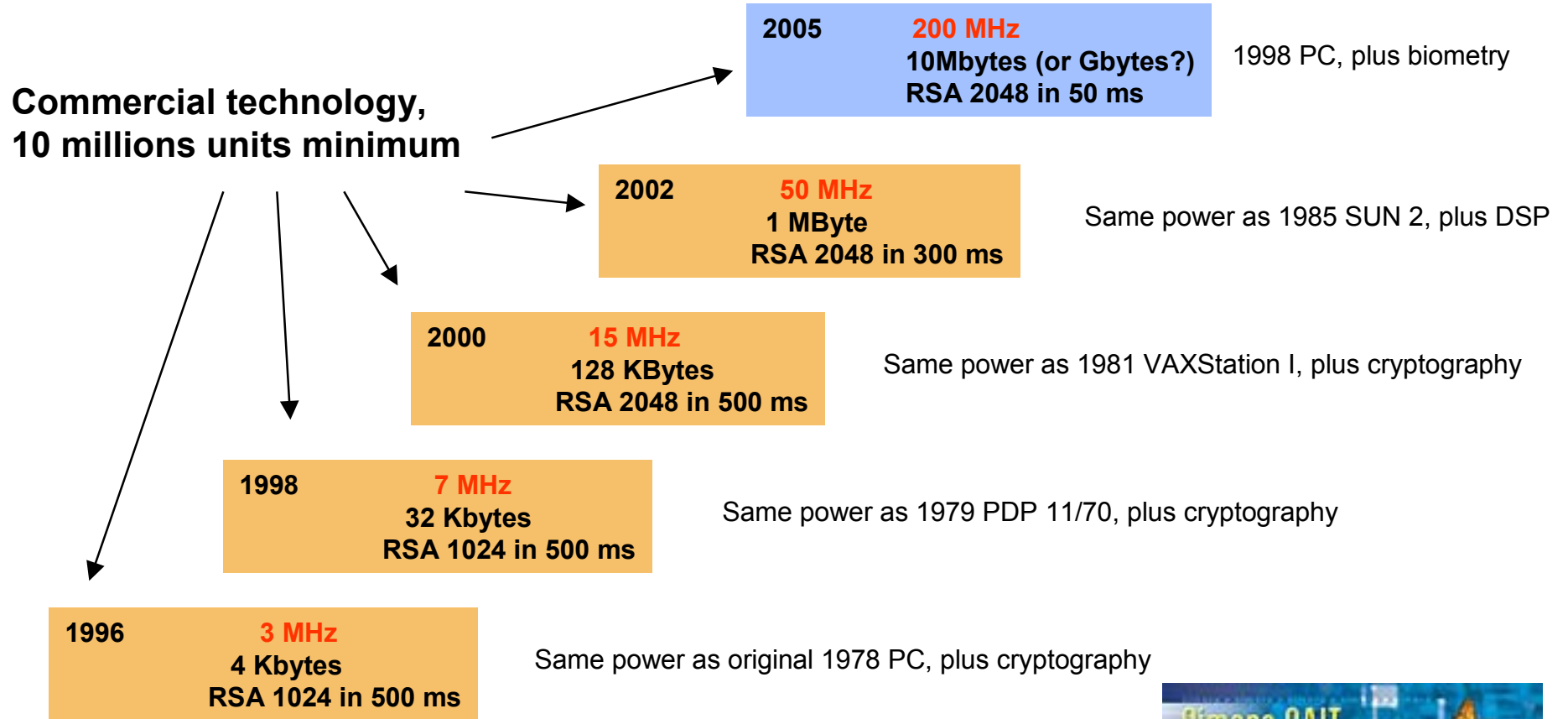


Schlumberger
Gemplus
G&D
Oberthur
Bull
Orga
Motorola

**Antenna
and DSP chip
(contactless)**



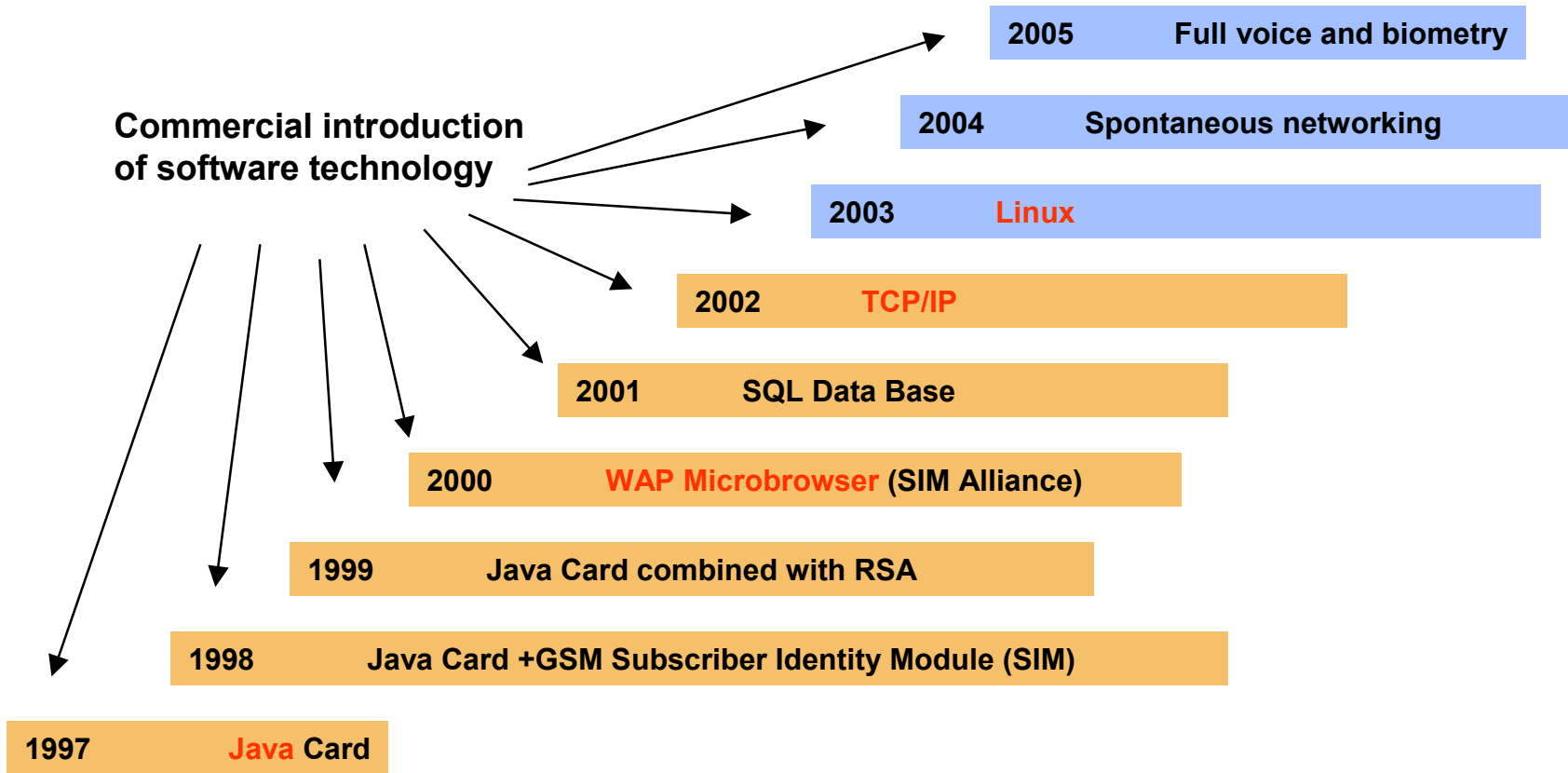
Smart card Hardware



**Smart Card chip size
25 Sq Millimeters**





Smart card Software



Smart Card chip size
25 Sq Millimeters



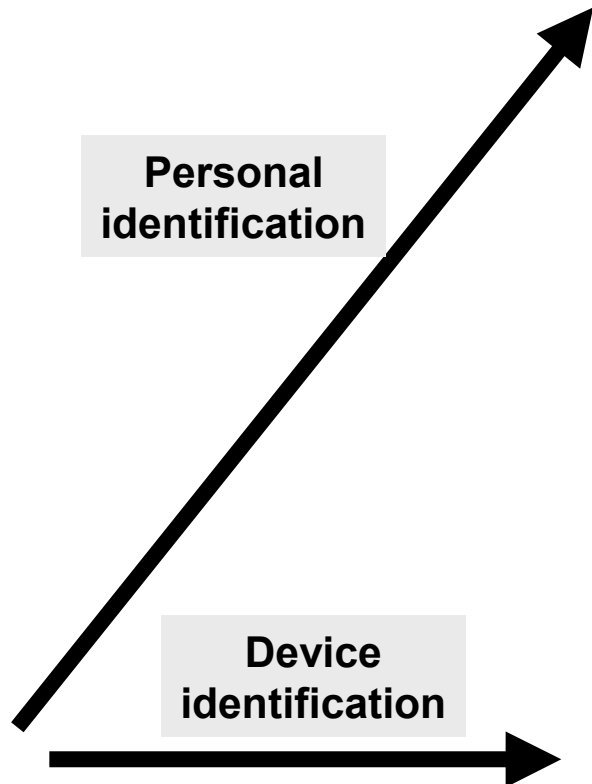
What 's a phone (circa 2003)



PALM



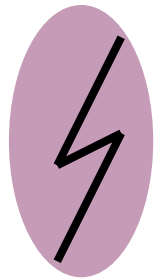
2002



2003

← Authentication
Security,
Personal
applications,
Audio/Video
interface

← Display,
Sensors,
Device
Applications,
Broadband



What 's a phone (circa 2005)



3GPP/GSM operators

2003



WASHmelia



E.g. power line

2005



TV



E.g. cable

2005



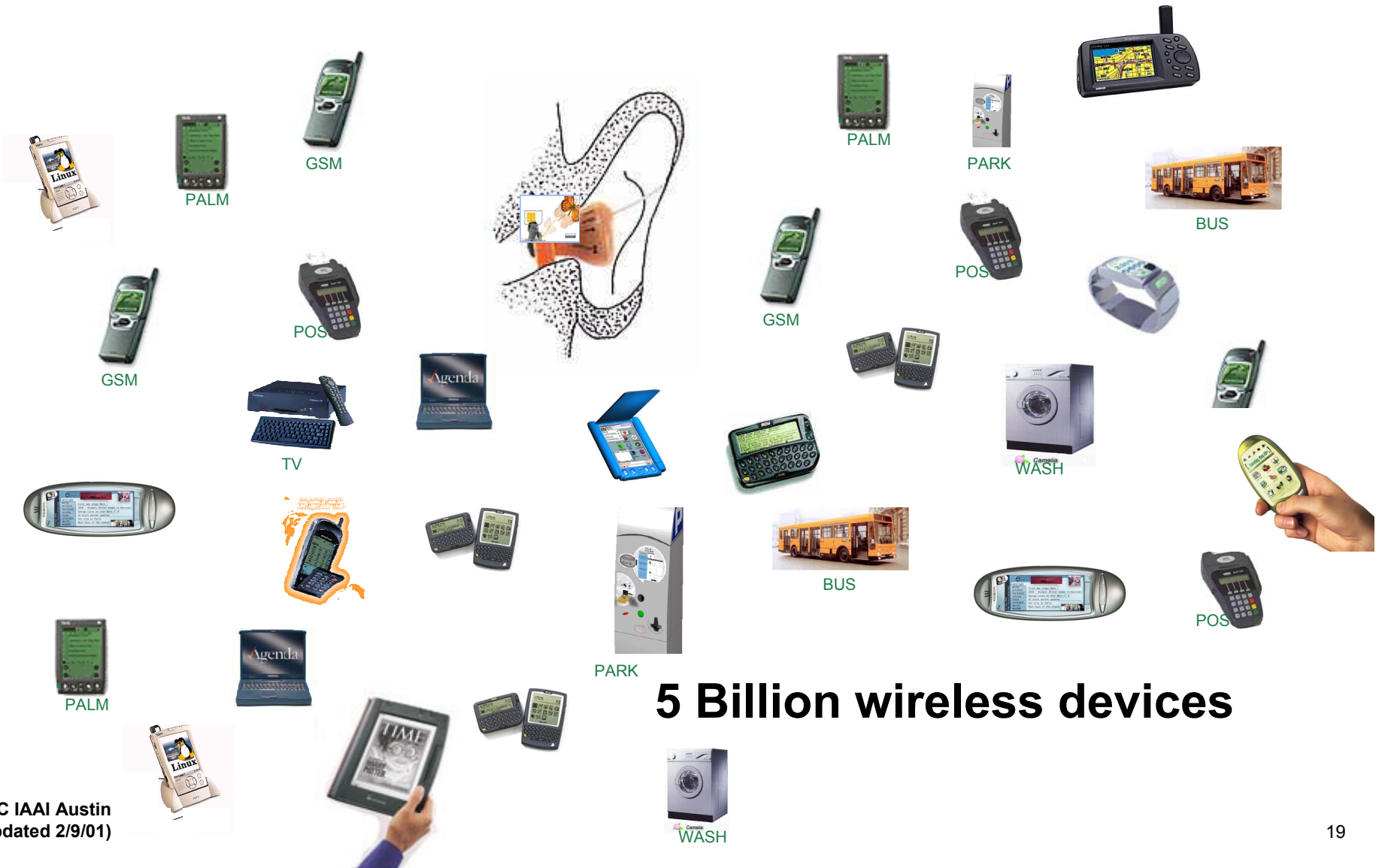
BUS



E.g. short range

2005

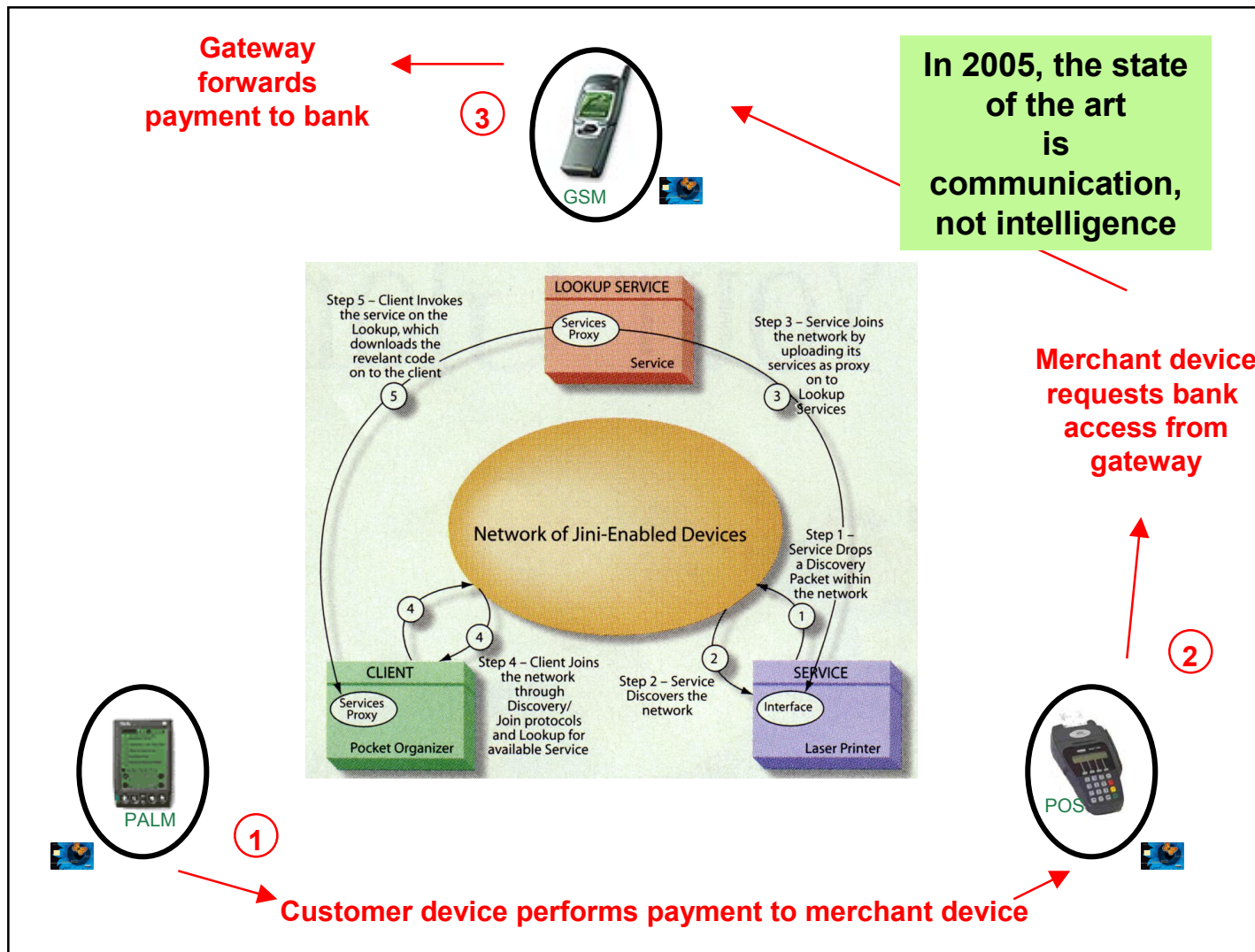
Wireless evolution (circa 2007)



Death of the washing machine

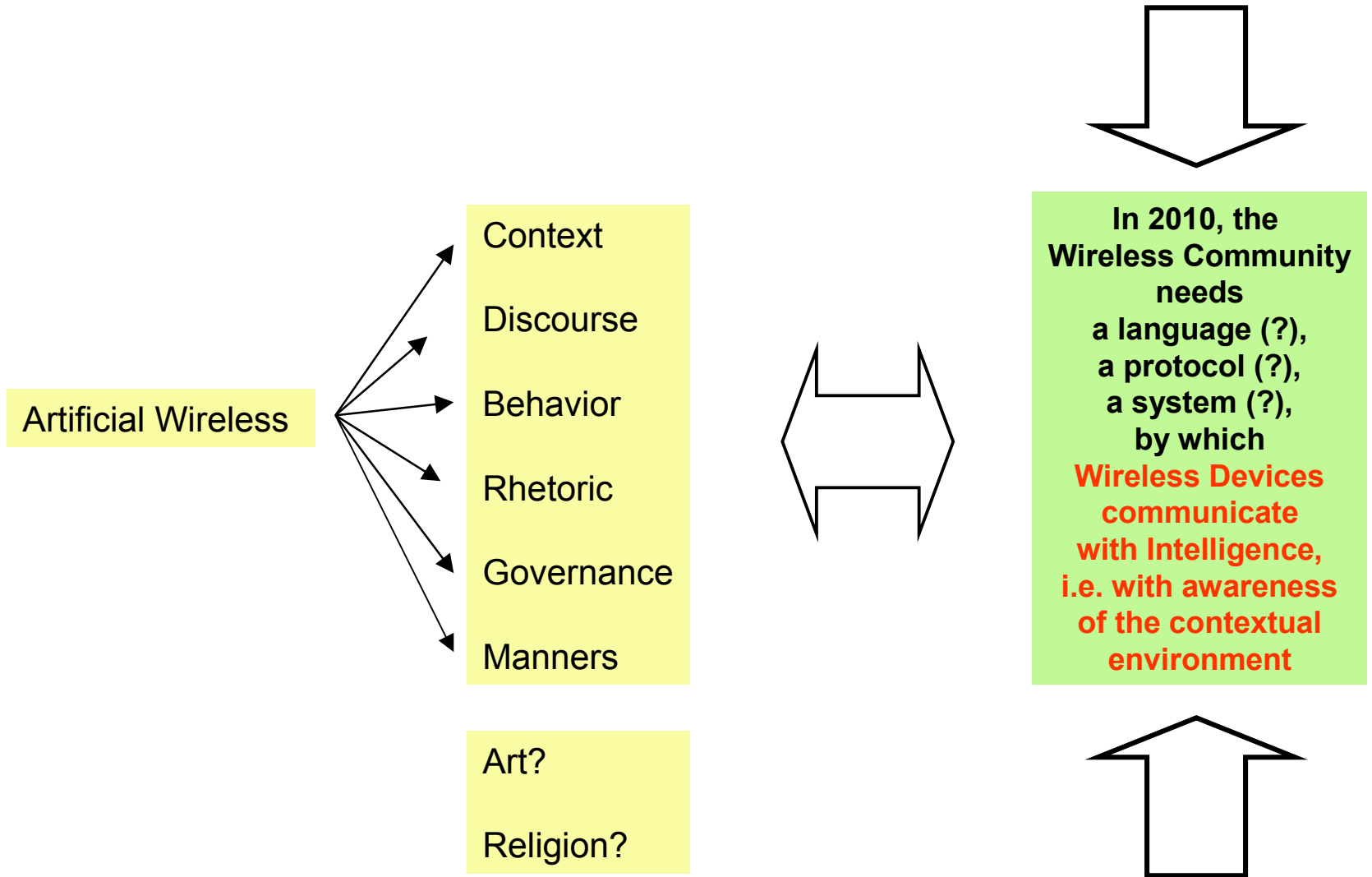


What's a phone (circa 2010)



In 2010, the Wireless Community needs a language (?), a protocol (?), a system (?), by which Wireless Devices communicate with Intelligence, i.e. with awareness of the contextual environment

Artificial Intelligence for Wireless



Intelligence

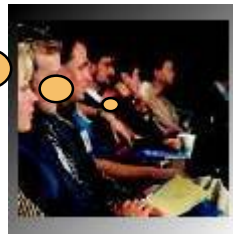


Intelligence
in artificial
wireless

Phones
and
Smart Cards

Washing
Machine?

Intelligence
in artificial
wireless



Intelligence
in artificial
wireless

Phones
and
Smart Cards

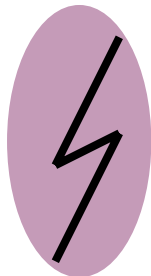


Intelligence in artificial wireless

Bertrand du Castel
Schlumberger

Natural Wireless + Evolution -> Natural Intelligence

Artificial Wireless + Evolution -> Artificial Intelligence





XVIII Century - Catacombes - Paris



XXI Century - Death of the Washing Machine