MExE

MExE

Mobile Execution Environment

…making the multimedia internet mobile…

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- **Mark Cataldo - Motorola , GTSS, GSM Applied Research**

- **Working to standardise services**

  - **3GPP TSG-S1 and 3GPP TSG-T2**

  - **WAP Forum**

- **MExE standardisation work**

  - **MExE Chairman**

  - **MExE Stage 1 editor**

  - **MExE Stage 2 editor**

2G and 3G Services
What is MExE ?
Example MExE services
MExE functionality
MExE security
MExE secure transfer
MExE timetable and summary

- **core network supplementary services (e.g. call forwarding, call barring, call diversion etc.)**

- **limited, expensive to develop, difficult to deploy**

- **all operators with same bland standardised services**

- **operators unable to differentiate**

- **tariffs are principle differentiators**
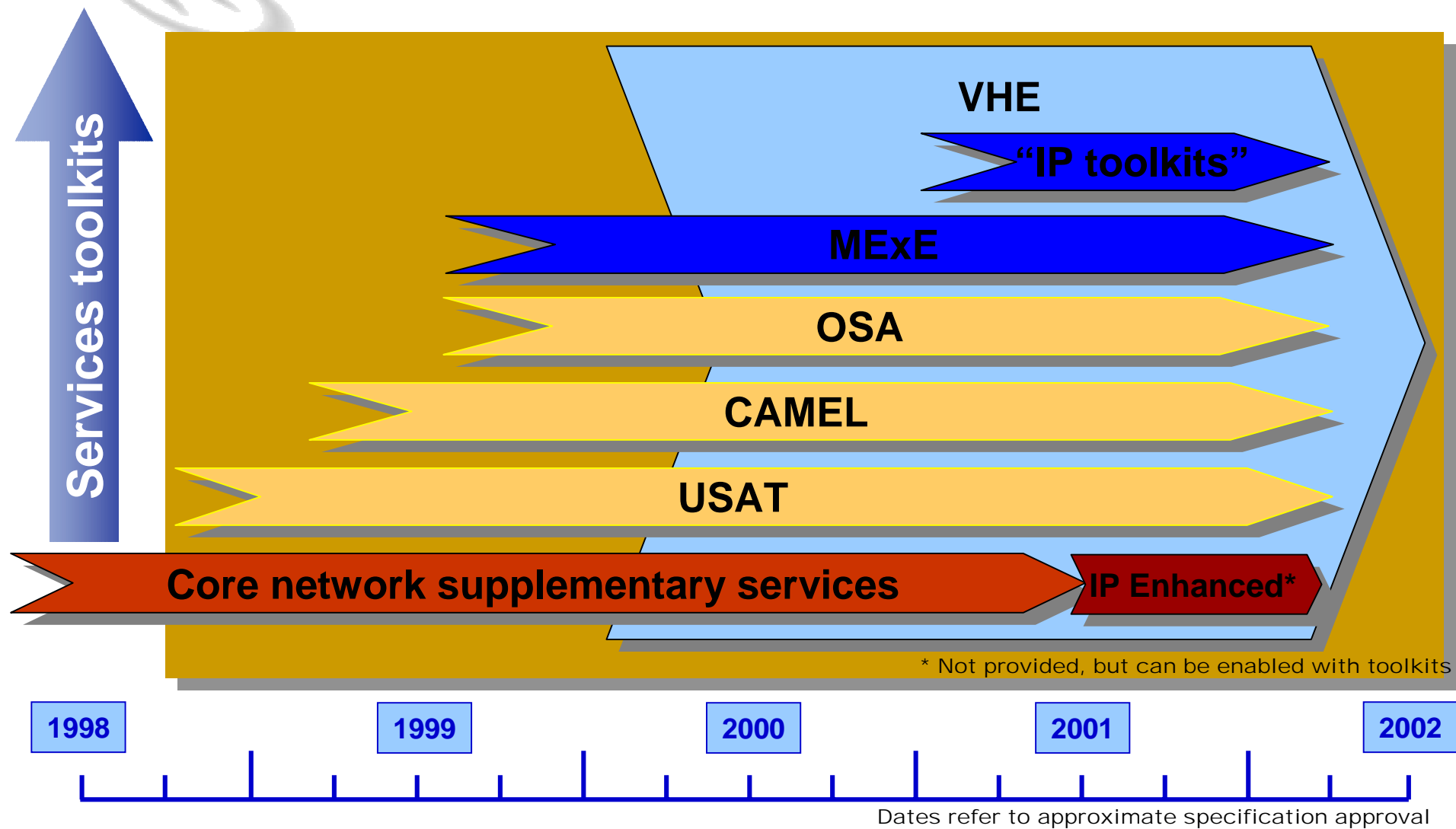
"one size fits all !!"

- **mobile phones fully internet integrated**

  – **internet and multimedia services, *on the move***

  – **by 2003 more people will be interacting with the WWW via wireless devices than traditional computers**

- **operator and third party multimedia services**

- **generally** ~~proprietary~~ **but enabled using 3GPP** ~~(MExE, CAMEL, USAT, OSA) and IP/IT~~

"*mass market of one*"

- **new personalised multimedia services rapidly developed to differentiate from competitors, reduce "churn"**

Services toolkits in 3G networks

MExE

Services toolkits

VHE

"IP toolkits"

MExE

OSA

CAMEL

USAT

Core network supplementary services

IP Enhanced*

* Not provided, but can be enabled with toolkits

| 1998 | 1999 | 2000 | 2001 | 2002 |

Dates refer to approximate specification approval

Mark Cataldo
22nd October, 2000

2G and 3G Services

What is MExE ?

Example MExE services

MExE functionality

MExE security

MExE secure transfer

MExE timetable and summary

- **standardised execution environments in a mobile phone**
  - **WAP**
  - **PersonalJava**
  - **CLDC/MIDP Java**

  Applicable to 3G, non-3G, cordless and fixed environments

- **IT/IP multimedia services <u>running on mobile phones</u>**
  - **write once, execute on many mobile phones**

- **transfer of multimedia services**
  - **up/downloading, network/3rd party, MExE-to-MExE services**

- **standardised negotiation of capabilities with servers**
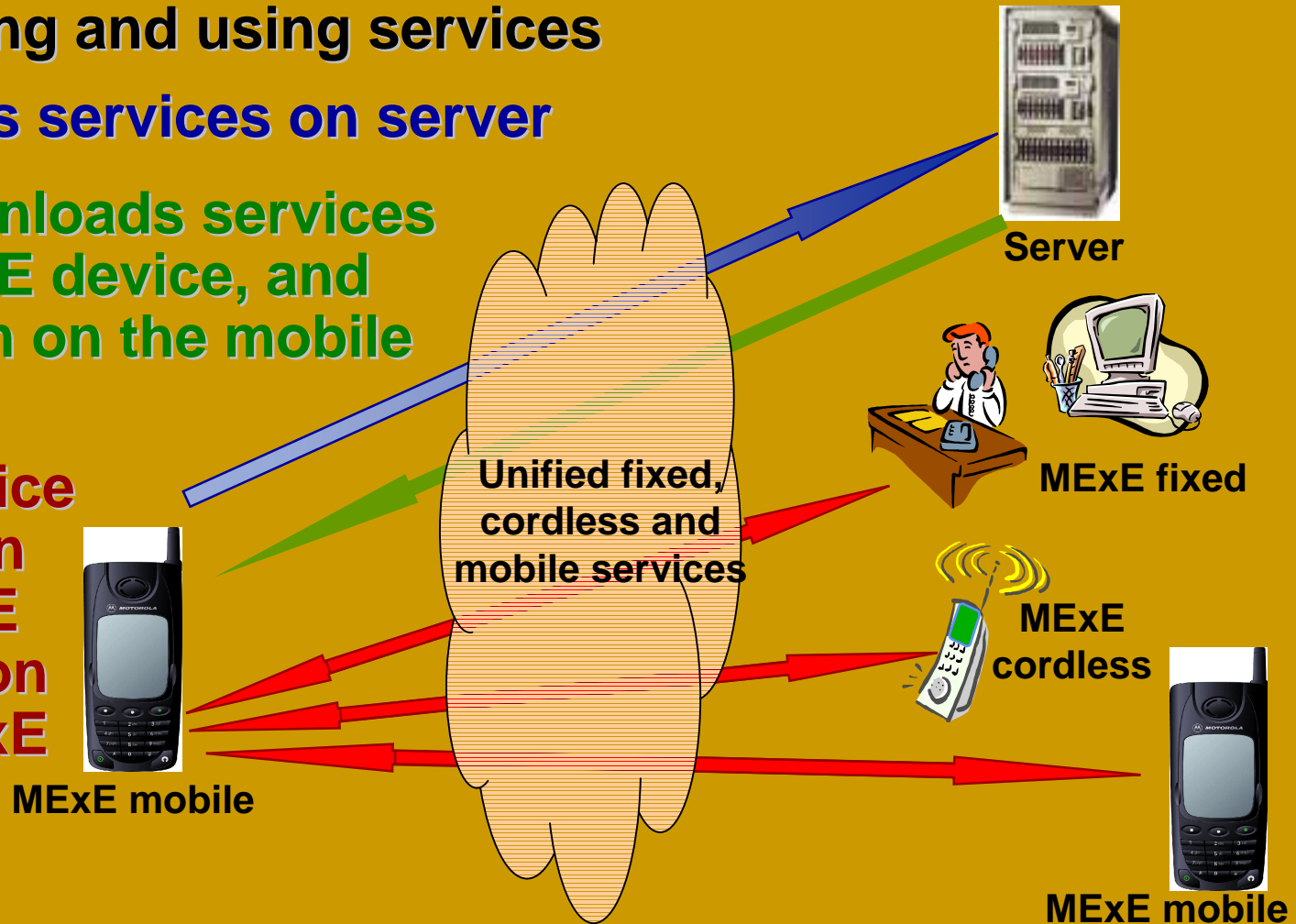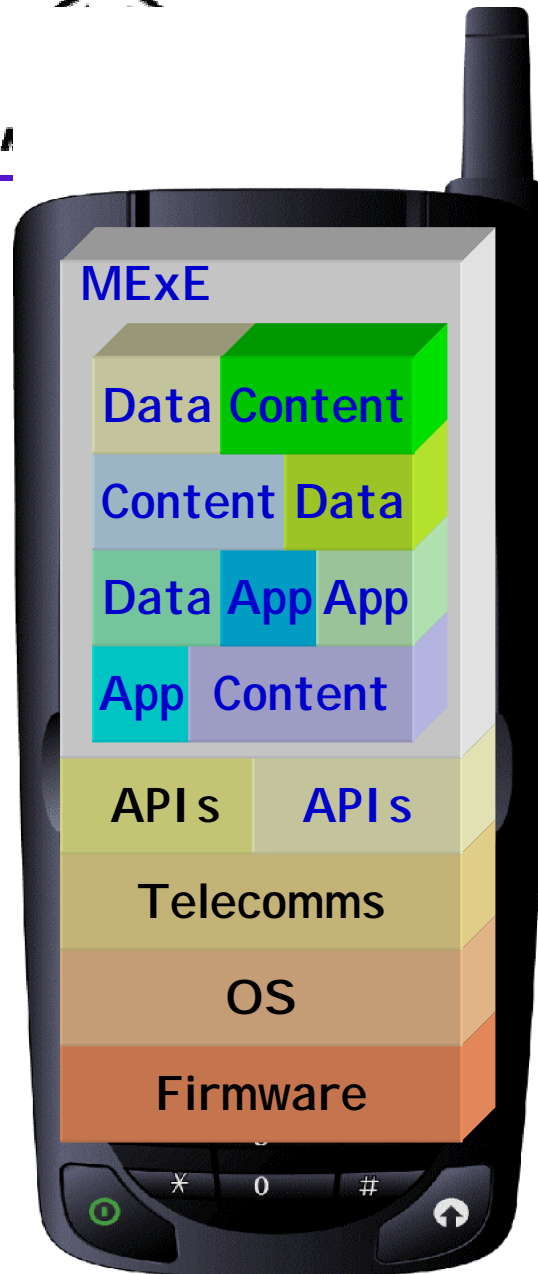 - **i.e. device type, screen size, memory, bearers etc.**

From analogue voice mobile to multimedia MExE mobile

MExE

"dumb" terminal

Mainframe computer

analogue voice mobile

Apps+Data

workstation

wireless-enabled laptop

LAN

Internet

voice/data mobile

Apps+Data

multimedia MExE mobile

Mark Cataldo
22nd October, 2000

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Downloading and using services

- **User uses services on server**

- **User downloads services onto MExE device, and runs them on the mobile**

- **User service interaction with MExE services on other MExE devices**

Server

MExE fixed

MExE cordless

Unified fixed, cordless and mobile services

MExE mobile

MExE mobile

MExE

The MExE framework sits in the mobile phone architecture…

MExE

Data Content

Content Data

Data App App

App Content

APIs APIs

Telecomms

OS

Firmware

◀ **MExE executables, data and content**

◀ **MExE framework (MExE classmark 1, 2, 3)**

◀ **APIs: manufacturer, MExE classmark**

◀ **GMS/UMTS software**

◀ **Mobile phone OS**

◀ **Manufacturer's firmware**

◀ **Manufacturer's mobile phone unit**

Phone, organiser, e-mail, multimedia messaging, e-books, e-newspapers, e-banking, e-commerce, music, video, and games all in one   mobile device!

2G and 3G Services
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- **one-touch telephony services**

Call Management

manage making/receiving of calls/messages with friendly personalised GUI on mobile or via user's homepage

Supplementary Services

call forward, diversion, barring, SMS, UUS, AOC etc. (e.g. "Meeting mode", divert time/day/location based business or personal calls)

Handset Management

phone settings (ringer tone, vibrator, ringer volume) etc.

MExE client

- **advanced mobile services and content**

E-mail

exchange multimedia messages, e-mails with audio, visual and textual attachments using <u>standard internet SMTP, POP3 and IMAP4 protocols</u>

Music and video Jukebox

Download and play music, video and multimedia using <u>standard formats</u> (e.g. SDMI, MP3, WMA, MPEG4 etc.)

Games console

play your favourite games from different manufacturers

MExE client

- **financial and commercial services**
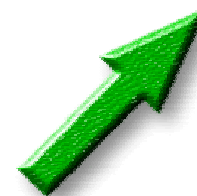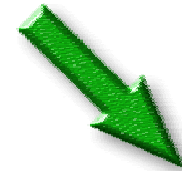

Stock markets

24 hour monitoring of your personalised share portfolio and world market indices

E-commerce

securely buy and sell shares, products and services; location based shopping information

Sports and news

keep track of your favourite sports team and games results; electronic books and personalised newspapers

MExE client

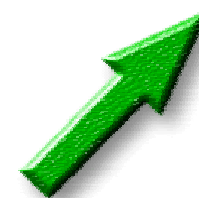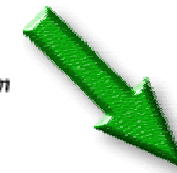- **access mechanisms to internet services**

WAP

use standard wireless optimised internet

Standard internet

surf the web's pages, images, animation and download using standard internet HTTP and HTML protocols

Corporate intranet

remotely access your office environment on the move

MExE client

- **Operator and terminal support services**

Advanced customer care

Interactive customer care, customised for classes of users and corporates; check pre-paid account (and add $)

Terminal diagnostics

"Repair" services identify faults and read/modify user's terminal settings

Terminal management

Network OA&M support of terminals and terminal data

MExE client

![Motorola logo]

Example MExE services

- **Commercial services and operator applications**

Networked devices

vending machines, travel and commuter signs/timetables, advertising billboards

MExE on wheels

personalised "Route Butler" traffic jam "Genie", automatic monitoring of car's systems, emergency calls, personalised car settings etc.

Handset upgrades

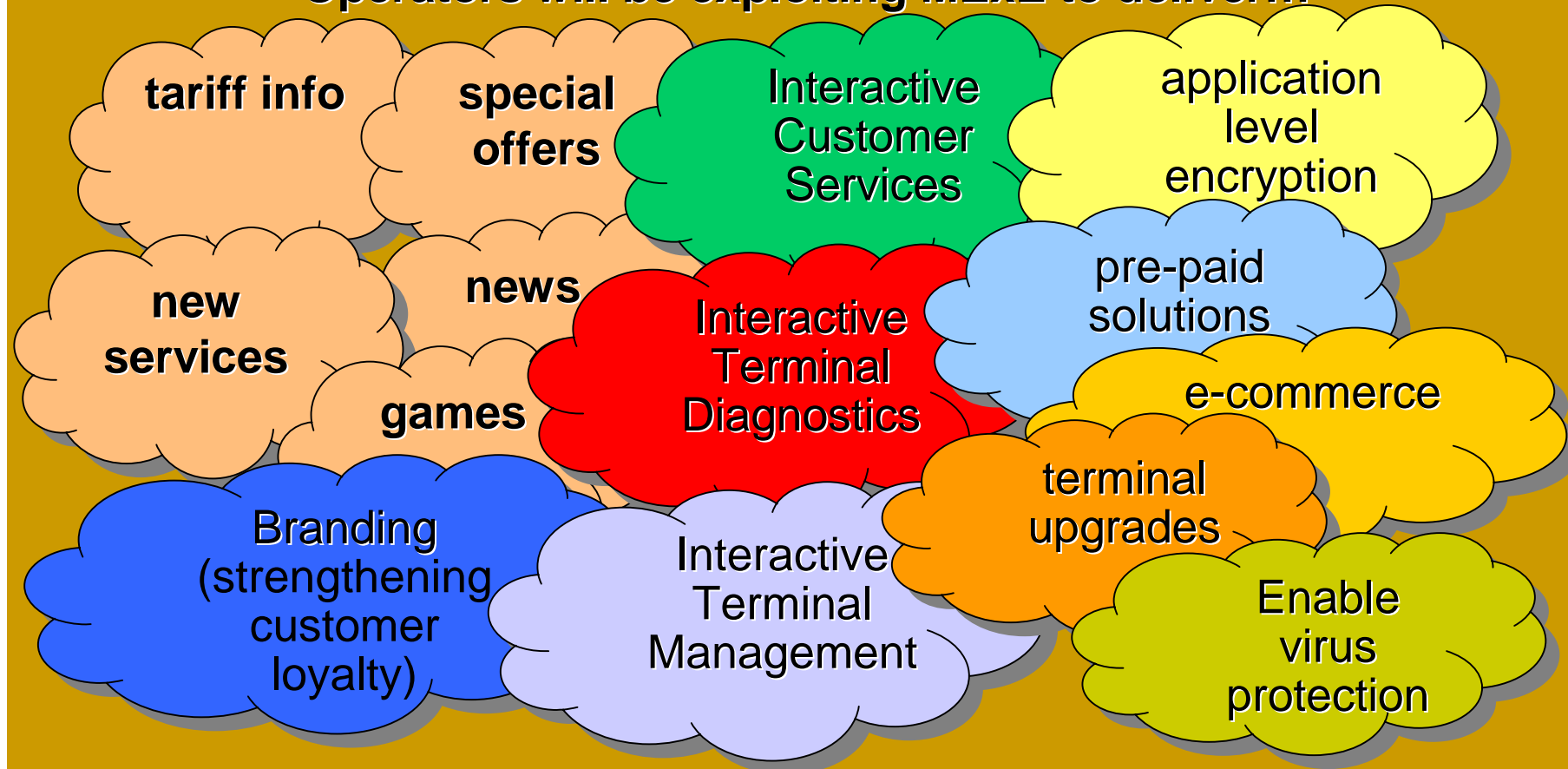**core software download; adopted by SDR Forum and supported by EU's TRUST project**

MExE client

- **Operators now requiring MExE in bid tenders**

Operators will be exploiting MExE to deliver…

tariff info

special offers

Interactive Customer Services

application level encryption

new services

news

Interactive Terminal Diagnostics

pre-paid solutions

games

e-commerce

Branding (strengthening customer loyalty)

Interactive Terminal Management

terminal upgrades

Enable virus protection

2G and 3G Services
What is MExE ?
Example MExE services
MExE functionality
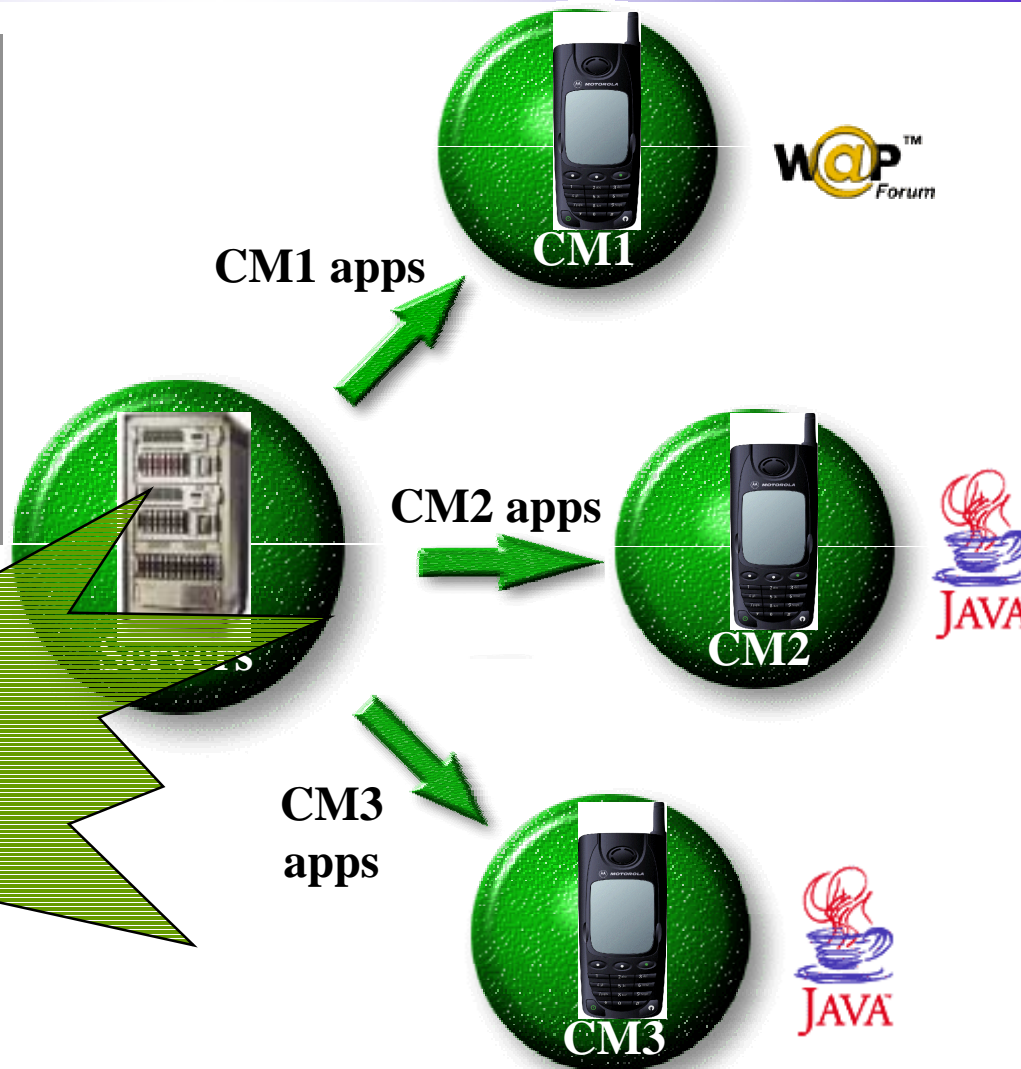MExE security
MExE secure transfer
MExE timetable and summary

- **standardised set of MExE classmarks**

- **Wide variety of multimedia services supported by all devices of a given classmark (CM)**

CM1 apps

CM2 apps

CM3 apps

CM1

CM2

CM3

Permitted app functionality depends on whether security domains are supported

MExE functionality (2)

- **a more sophisticated user interface**
  - advanced presentation
  - Graphical User Interface (GUI)
- **security**
  - supported by 3GPP TSG-S3 security committee
  - secure domains and "untrusted" domains (app functionality dependent on domain)
  - PKI security certificates
  - protection of user private data
  - controlled access to functionality
  - controlled access to network resources

MExE functionality (3)
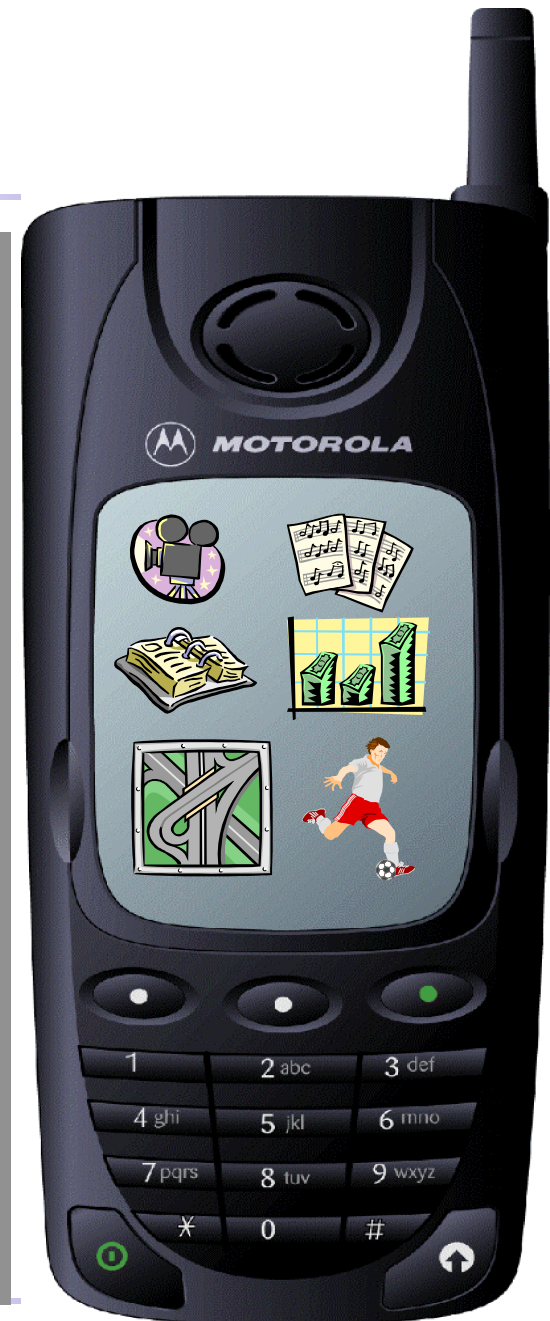
- **customisation and personalisation**

  - services "look and feel" personalisation

  - user interface personalisation

  - services communication with network/non-network nodes

  - operator/content provider branding and differentiation

- **user services management**

  - services download

  - services/data management

  - determine active services

MExE functionality (4)

- **re-use of existing technologies**

  - **IT and IP world expertise, services and development tools**

  - **WAP, Internet and Intranet**

  - **existing APIs, (i.e. WAP, PersonalJava, MIDP/CLDC Java...)**

  MExE does not create technology, but adds user and operator security onto leading edge world standards
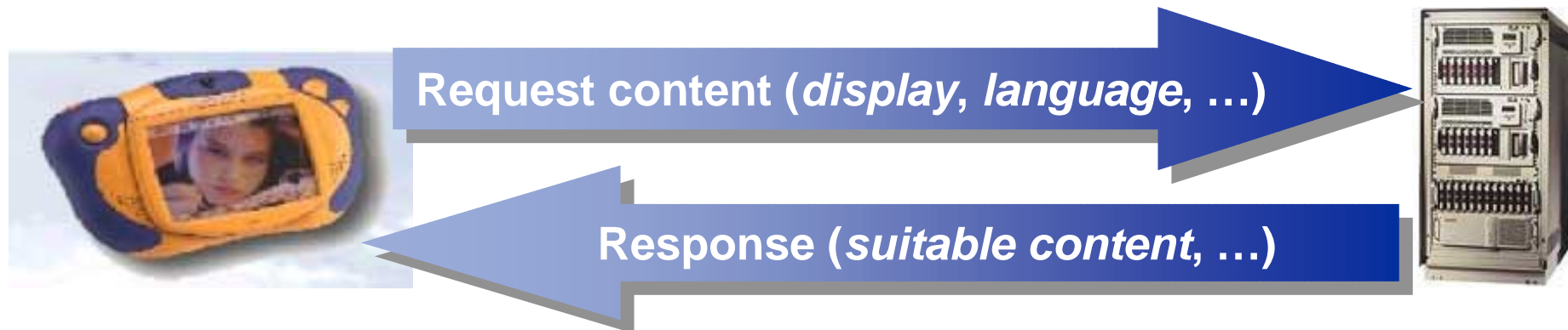
- **capability negotiation**

  - **allows servers and MExE mobile phones to determine the most suitable content format for the device (e.g. depending on screen size, memory, colour capabilities etc.)**

Request content (*display*, *language*, …)

Response (*suitable content*, …)

2G and 3G Services
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Example MExE services
MExE functionality
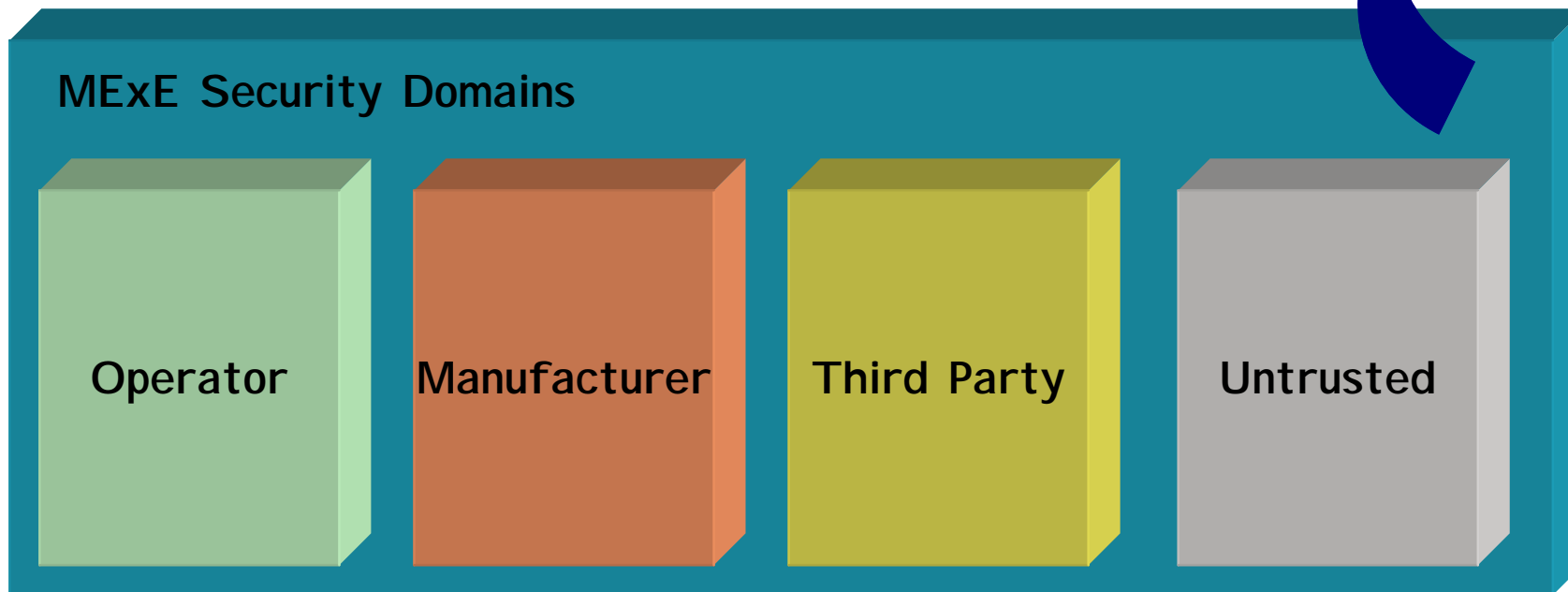**MExE security**
MExE secure transfer
MExE timetable and summary

MExE Security Domains

- **secure environment for multimedia services**

- **3 optional security domains (PKI certificates)**

- **1 "untrusted" domain**

MExE Security Domains

Operator	Manufacturer	Third Party	Untrusted

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Operator
Server

Manufacturer
Server

Third Party
Server

MExE Security Domains

- Operator
- Manufacturer
- Third Party
- Untrusted
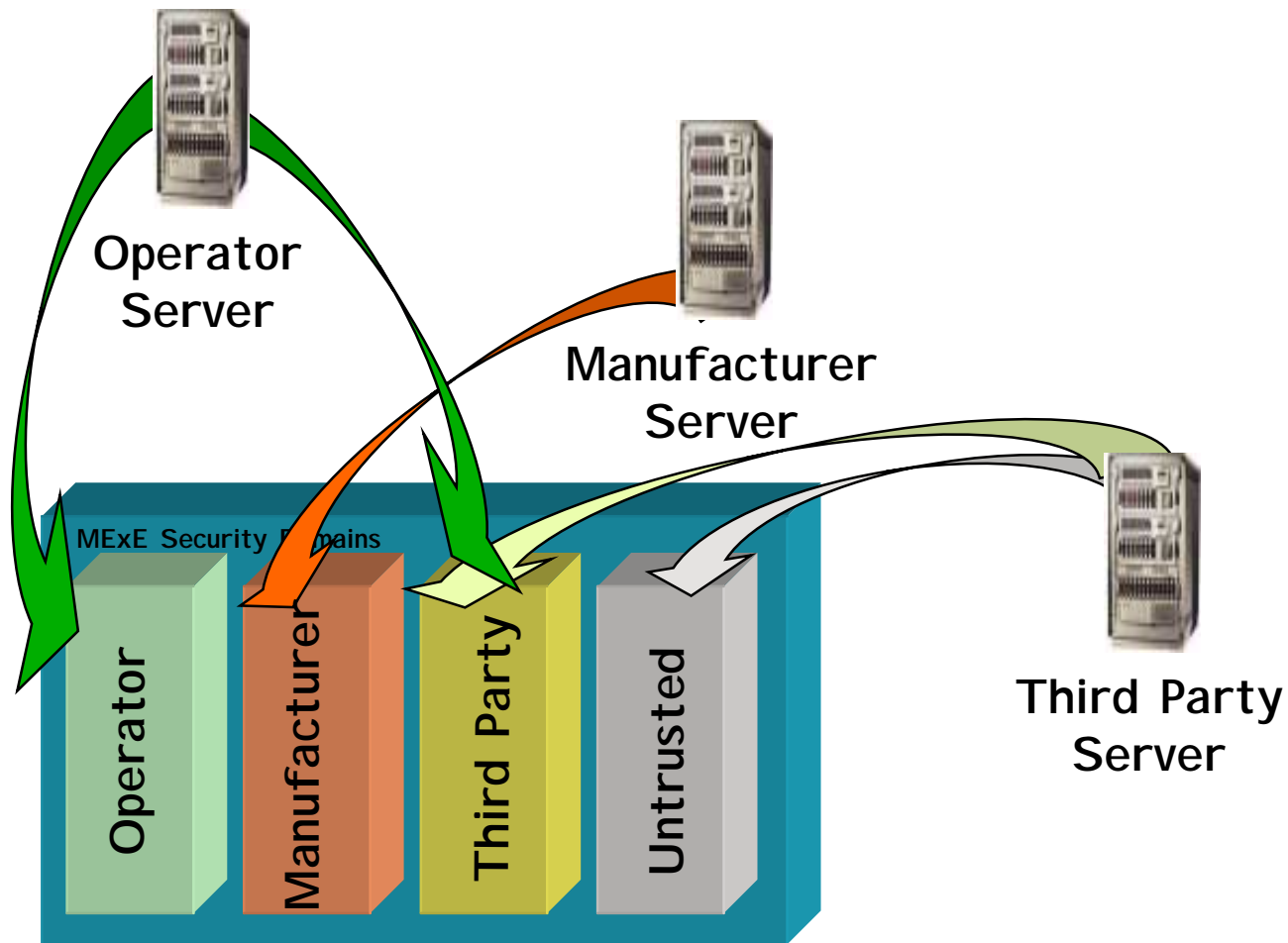
- **operator controls operator domain**

- **manufacturer controls manufacturer domain**

- **operator or user controls third party domain**

- **user controls untrusted sandbox**

Operator's Domain

MExE

MOTOROLA

Operator Server

MExE Security Domains

Operator | Manufacturer | Third Party | Untrusted

- **exclusively for operator**

- **only operator authenticated multimedia services permitted**

- **operators provide existing services and new multimedia services**

  - **branded services**

  - **franchised services**

  - **customer care and diagnostics**

  - **service personalisation**

Motorola Proprietary

Handset Manufacturer's Domain

MExE

Manufacturer Server

MExE Security Domains

- Operator
- Manufacturer
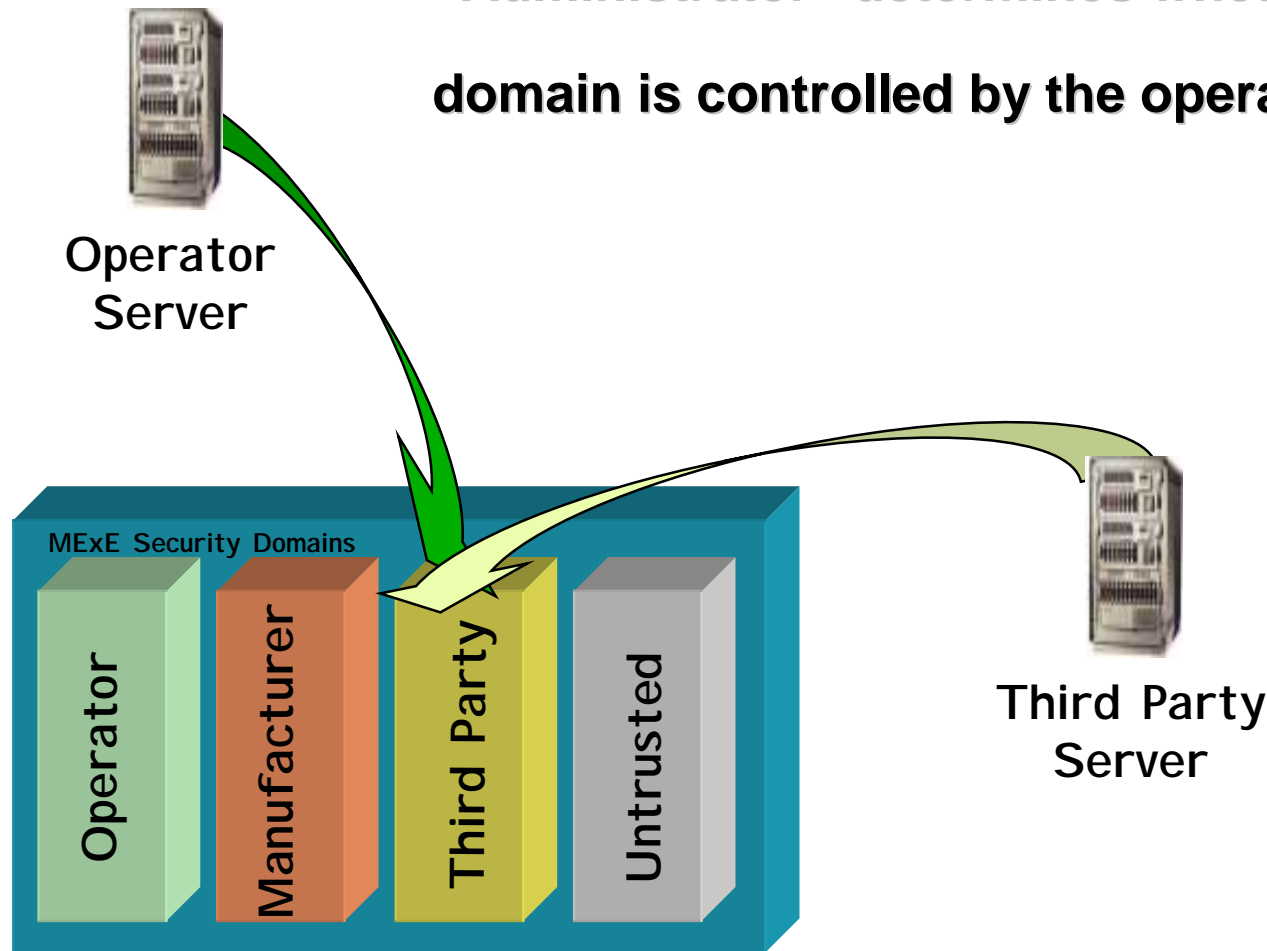- Third Party
- Untrusted
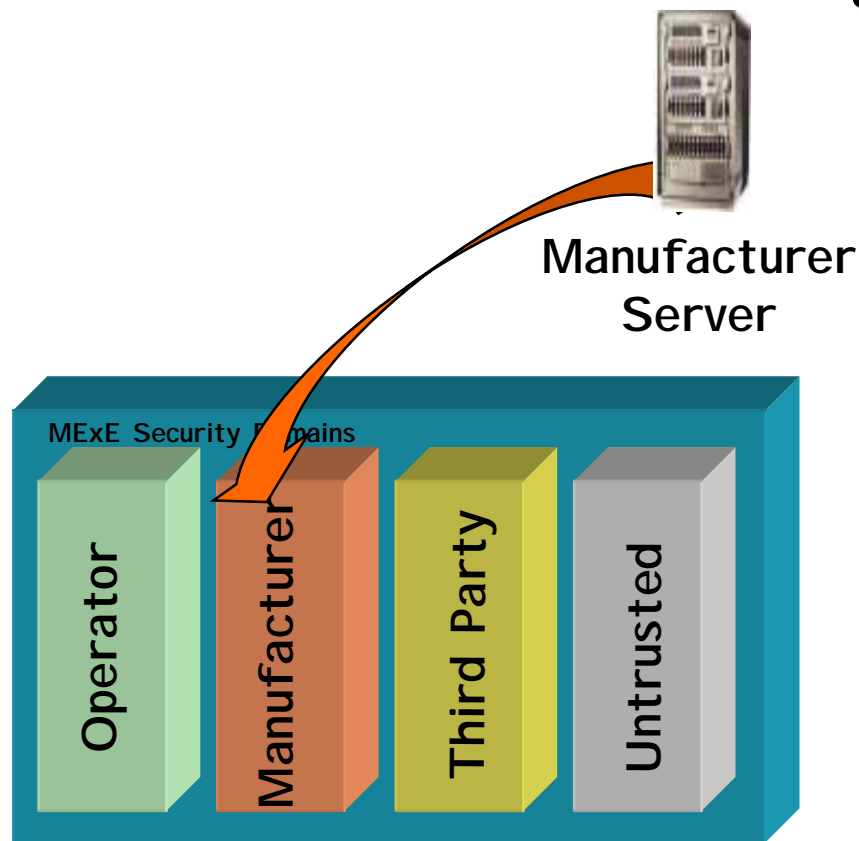
- **handset manufacturer in control**

- **permits mobile phone upgrades**

  - **"provisioned applications" upgrade**

  - **user interface upgrades**

  - **software upgrades**

  - **manufacturer's multimedia services**

MOTOROLA

"Administrator" determines whether Third Party

domain is controlled by the operator or user

Operator
Server

MExE Security Domains

Operator | Manufacturer | Third Party | Untrusted

Third Party
Server

- **Operator controlled**

   operator decides

   which services may

   be downloaded

- **User controlled**

   user decides which

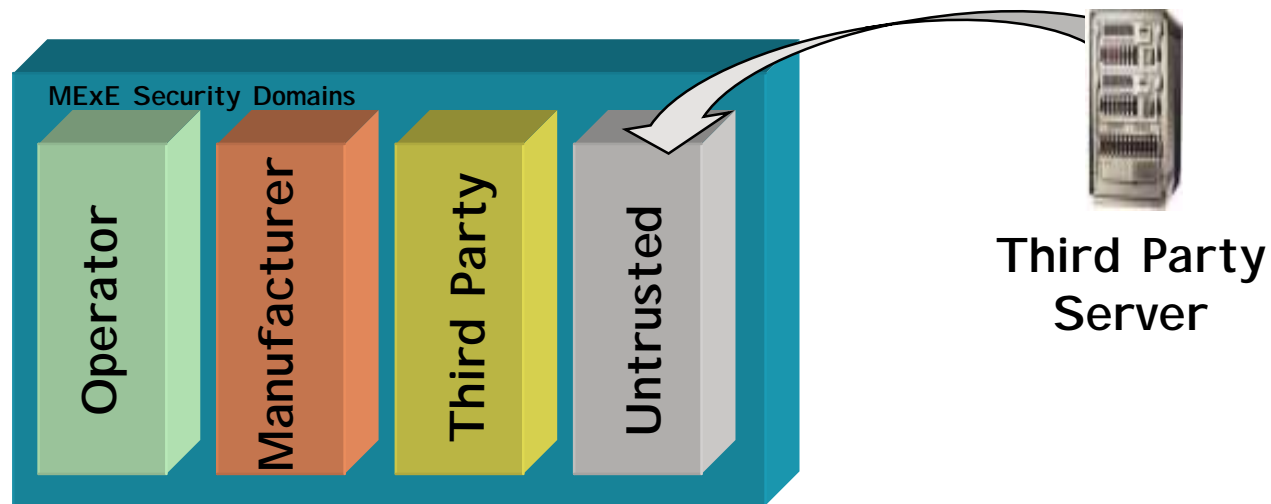   third party services

Untrusted Domain

- **user in control of the untrusted domain**

- **user downloads any multimedia service as desired**

- **downloaded multimedia services have limited permissions**

- **call origination (only with explicit user authorisation)**

- **screen access**

- **sending DTMF**

- **add phonebook entry**

MExE Security Domains

Operator | Manufacturer | Third Party | Untrusted

Third Party Server

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	CM1	CM2	CM3
Technology	WAP	PersonalJava	CLDC/MIDP Java

Security Domains

	CM1	CM2	CM3
Operator	Optional	Optional	✗
Manufacturer	Optional	Optional	✗
Third Party	Optional	Optional	✗
Untrusted	✔	✔	✔

CM3 support of secure domains dependent on proprietary solutions

MOTOROLA
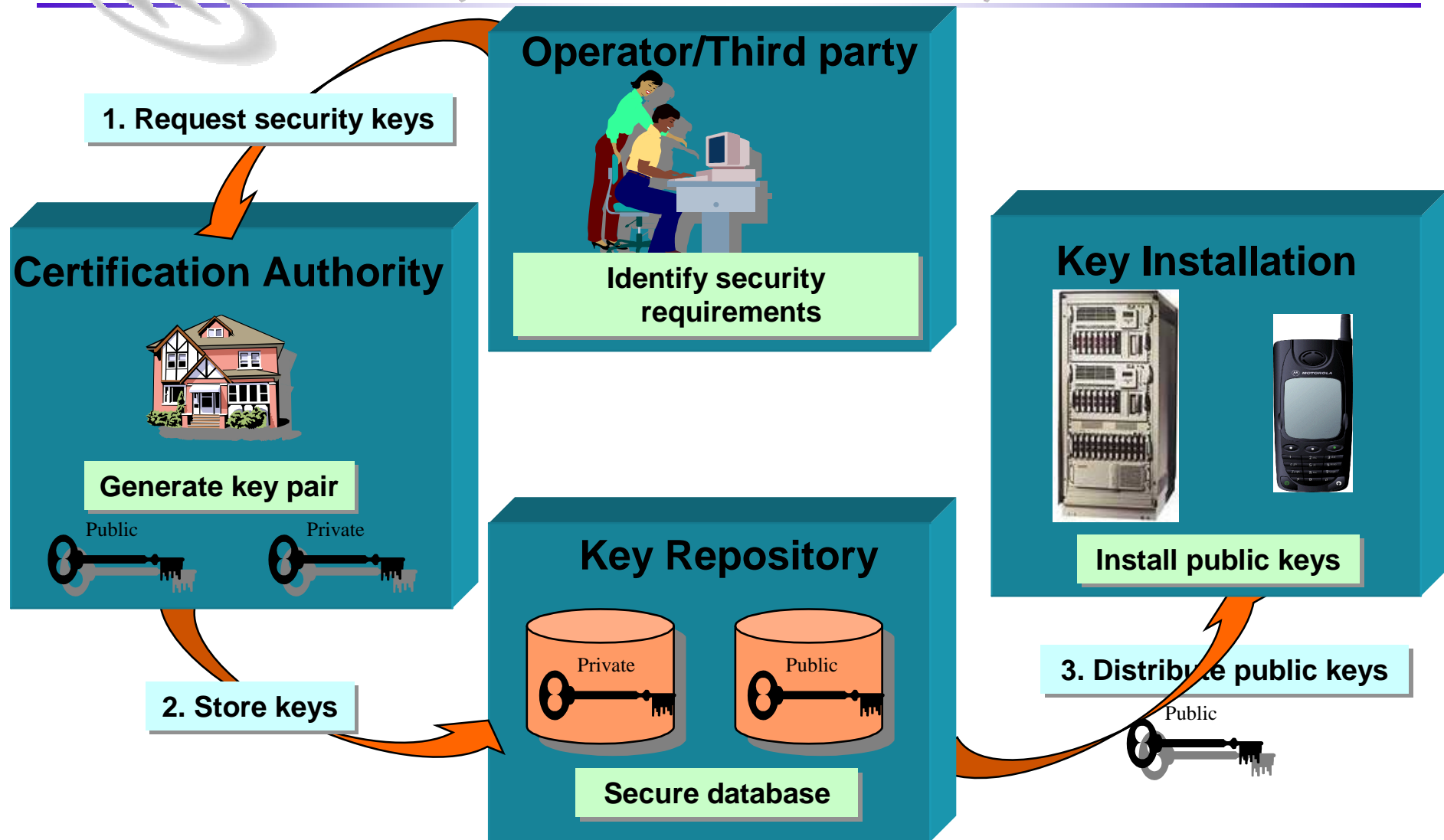
**2G and 3G Services
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MExE timetable and summary**

Security key management / installation (WAP and PersonalJava)

MExE

Operator/Third party

Identify security requirements

Certification Authority

1. Request security keys

Generate key pair

Public   Private

2. Store keys

Key Repository

Private   Public

Secure database

Key Installation

Install public keys

3. Distribute public keys

Public

MExE secure transfer/authentication (WAP and PersonalJava)
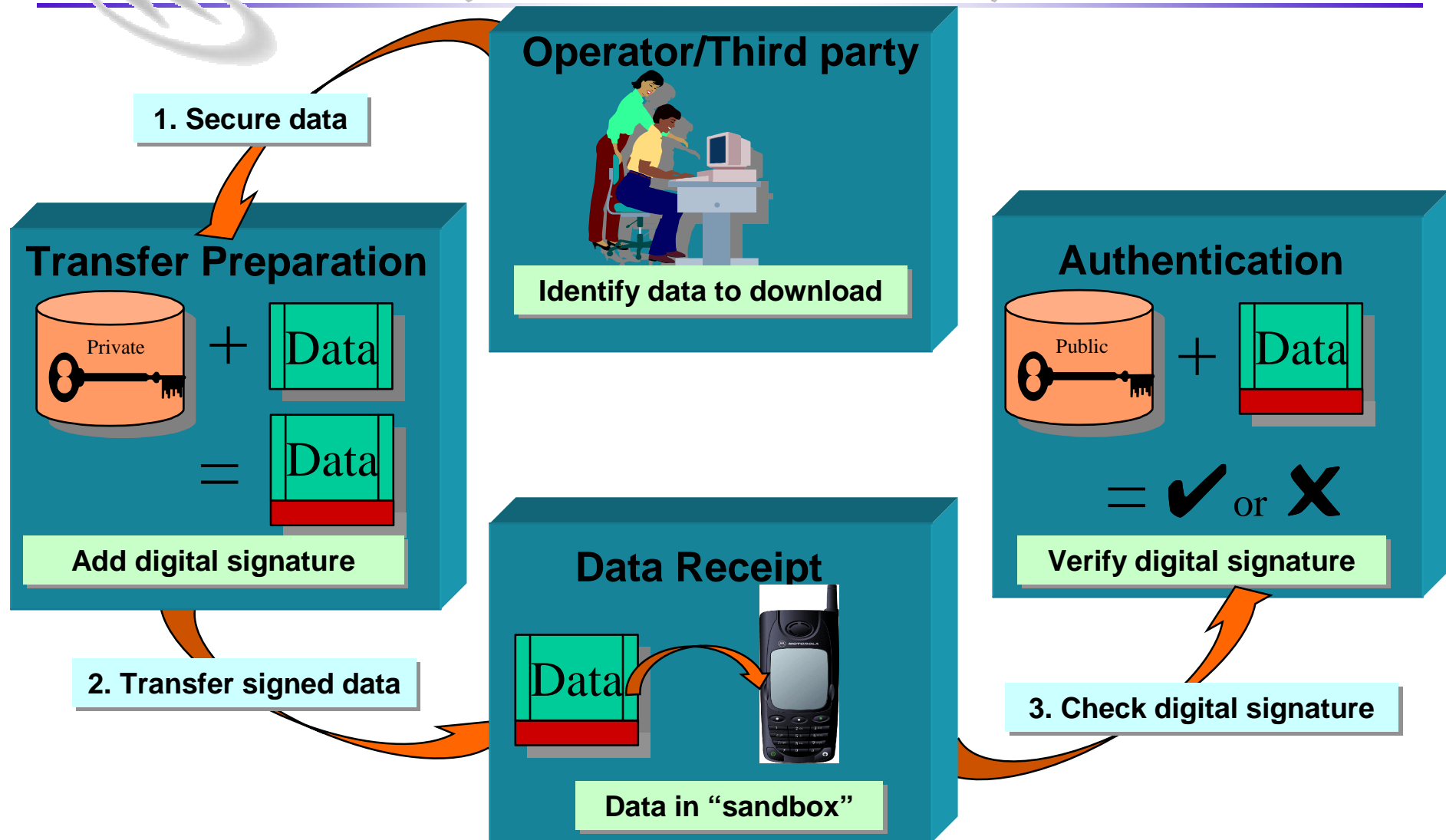
MExE

Operator/Third party

Identify data to download

1. Secure data

Transfer Preparation

Private $+$ Data

$=$ Data

Add digital signature

2. Transfer signed data

Data Receipt

Data

Data in "sandbox"

Authentication

Public $+$ Data

$= \checkmark$ or $\times$

Verify digital signature

3. Check digital signature

Mark Cataldo
22nd October, 2000

**2G and 3G Services
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MExE timetable and summary**

- **MExE (Release 98) - approved 2Q99**

  - **WAP and PersonalJava classmarks**

- **MExE (Release 99) – approved 4Q99**

  - **SIM security enhancements**

  - **Quality of Service support**

- **MExE (Release 2000/Release 4)**

  - **CLDC/MIDP Java classmark**

  - **Core software download support**

  - **approval expected 4Q00**

- **approved 3GPP standard**
  - wireless technology agnostic, not just 3GPP
  - multi-environment: mobile, cordless, fixed

- **enables unified multimedia services for mobile, cordless and fixed networks**

- **internet access, and internet multimedia services on mobile devices**

- **exploits IT/IP world expertise**
  - IP-compatible, rapidly developed, low cost services

- **supports authentication and security domains**