Instant Personalization & Temporary Ownership of Handheld Devices

RESEARCH GROUP FOR
Distributed Systems

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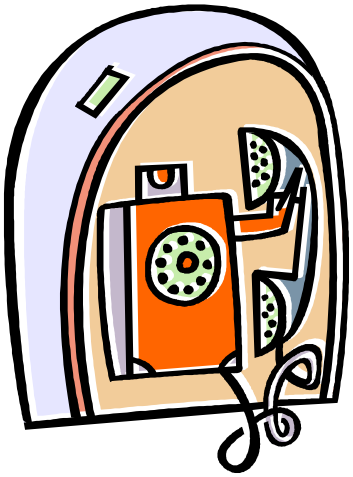
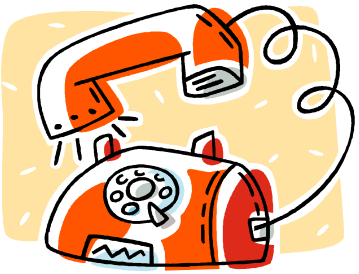
Impersonal Stationary Devices

+ Simple deployment, setup, configuration (generic functionality)
+ Support for sharing and pooling of devices
– Lack of personalization limits efficiency and ease of use
– Limited accessibility



Public Phone

Public Terminal



Plain Phone

Personal Stationary Devices

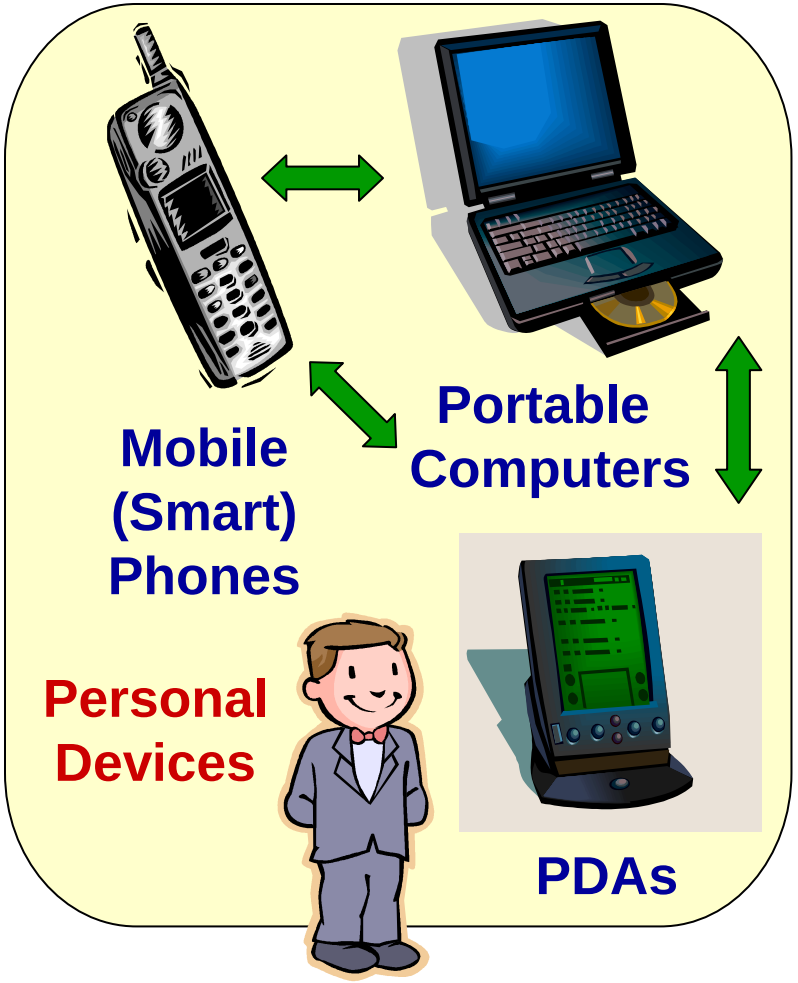
+ Increased ease of use and efficiency by means of personalization and customization
+ Improved accessibility and convenience…
– …but still limited in numbers
– Restricted sharing and pooling of devices (smaller and closed user groups)

Personal Programmable Cable Phones

Personal Home/Office PC

Personal Mobile Devices

+ Rapidly proliferating and even becoming everyday live commodities
+ Portability significantly improves accessibility and enables anywhere/anytime utilizability
– Exclusive personal use and ownership strongly limits sharing and pooling
– High complexity of data management
– Ever shorter lifecycles



Observations

- Particular strength of handhelds = portability, device-specific functionality, advanced personalization and customization capabilities
- Individuality of handheld devices is strongly determined by personal meta data
  - individual preferences, device and application settings, user names and passwords, etc.

Motivation

Problem & Challenge

- **Problem:** Increasing dependence on mobile devices and services at work and in everyday life situations
- **Challenge:** Ensure availability of personalized devices and the accessibility of services they deliver
  - devices may be left behind unintentionally, run out of energy, get lost, stolen, break beyond repair…

Remainder of the Talk

- Instant Personalization and Temporary Ownership
- Horizontal vs. Vertical Diversification
- Prototype Description
- Conclusion

Outlline

Instant Personalization (IP)

- Free user from dependence on individual personal mobile devices…
- …while preserving the benefits he expects of personalization and customization!

→ Instant personalization of mobile devices

- Enables user to take temporary ownership of arbitrary devices on demand
- Boosts number of devices potentially available to the user from one to “infinity”

Basic User Experience

1. Pick up arbitrary blank device
2. Log on to Instant Personalization Server (IPS)
   - → triggers instant personalization procedure
   - → individual preferences & settings (meta data) and personal user data are installed on the device
3. Utilize personalized device
   - → ideally: temporarily owned device indistinguishable from a permanently owned personal device
4. Release device
   - → modified user/meta data are written back to IPS
   - → device is cleared of any personal user/meta data

Benefits

+ Interchangeability of handheld devices increases accessibility of personalized device functionality, and…
+ …the availability of personal user data, facilitating anytime, anywhere access
+ Provides support for the sharing and pooling of handheld devices
+ Personalization outlasts device lifecycle

Benefits (cont.)

+ Support for disconnected operation
+ Recovery of personal user data (from physically unavailable but network connected devices)
+ Protection of confidentiality of personal user data (by means of automatic or server initiated release)
+ Support for periodic data backup

Cross-Platform Personalization

- Personalization procedure depends on
  - type and capabilities of the mobile device
  - operating system
  - installed standard applications
- Challenge: widen applicability of personal data accross platforms
  - standardized application interfaces
    - e.g., Microsoft Pocket Outlook Object Model (POOM)
  - personalization profiles
    - defining structure and vocabulary of personal user settings and preferences

Trust and Security Challenges

- Authentication via username and password
  - fingerprint hardware in today's off-the-shelf devices is insecure and cannot be trusted → not useful for secure authentication (yet)
  - secure communication channels (SSL)
- Challenge: how to ensure that an anonymous mobile device has not been tampered with?
  - promising approach: Trusted Platform Model (TPM) by the Trusted Computing Group (TCG)
- Means of secure authentication
  - one-time authentication schemes
  - trusted hardware tokens
  - challenge-response mechanisms
- Challenge: protect data confidentiality
  - prevent unauthorized data recovery after device was released

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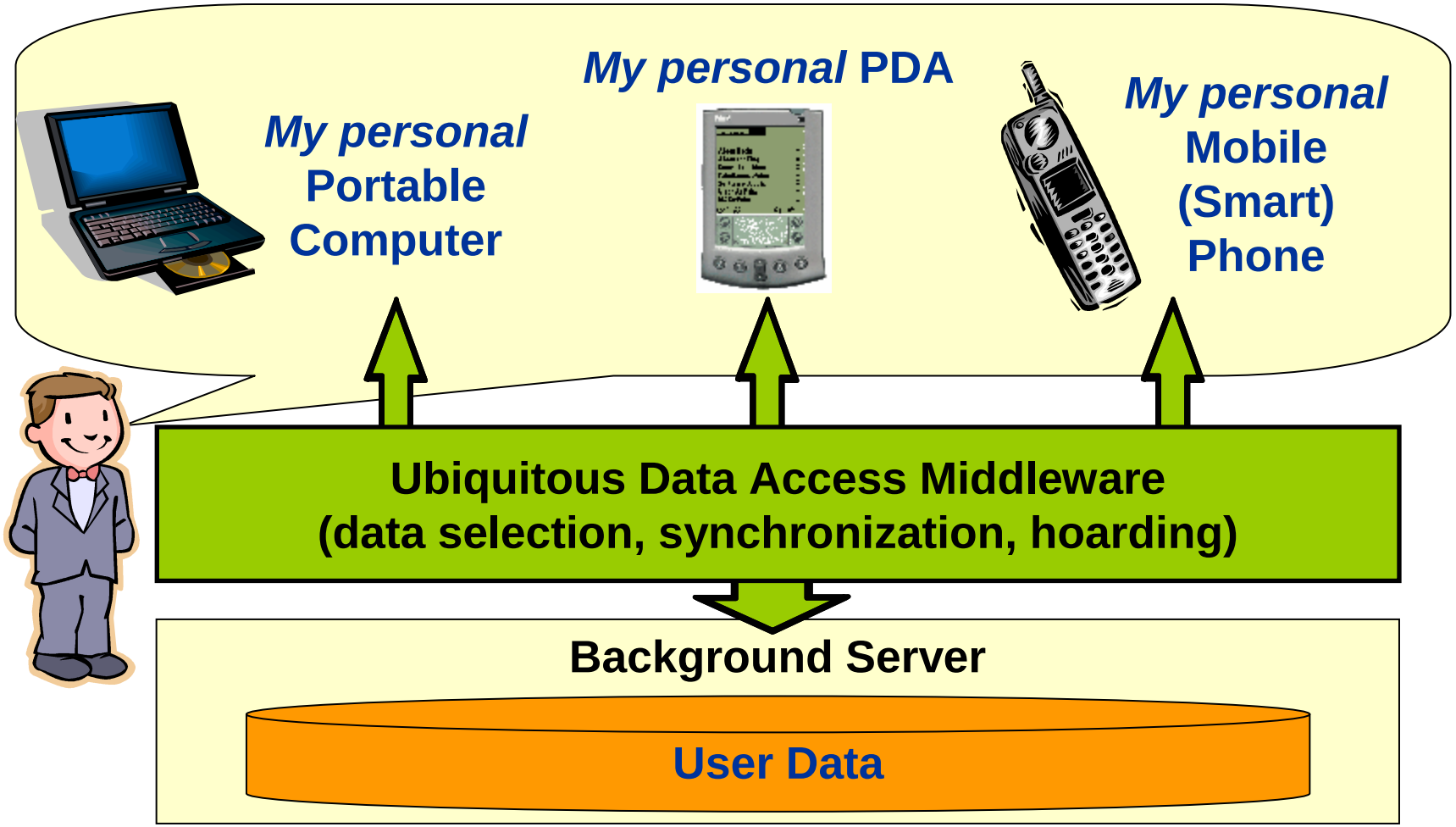
Ubiquitous Data Access



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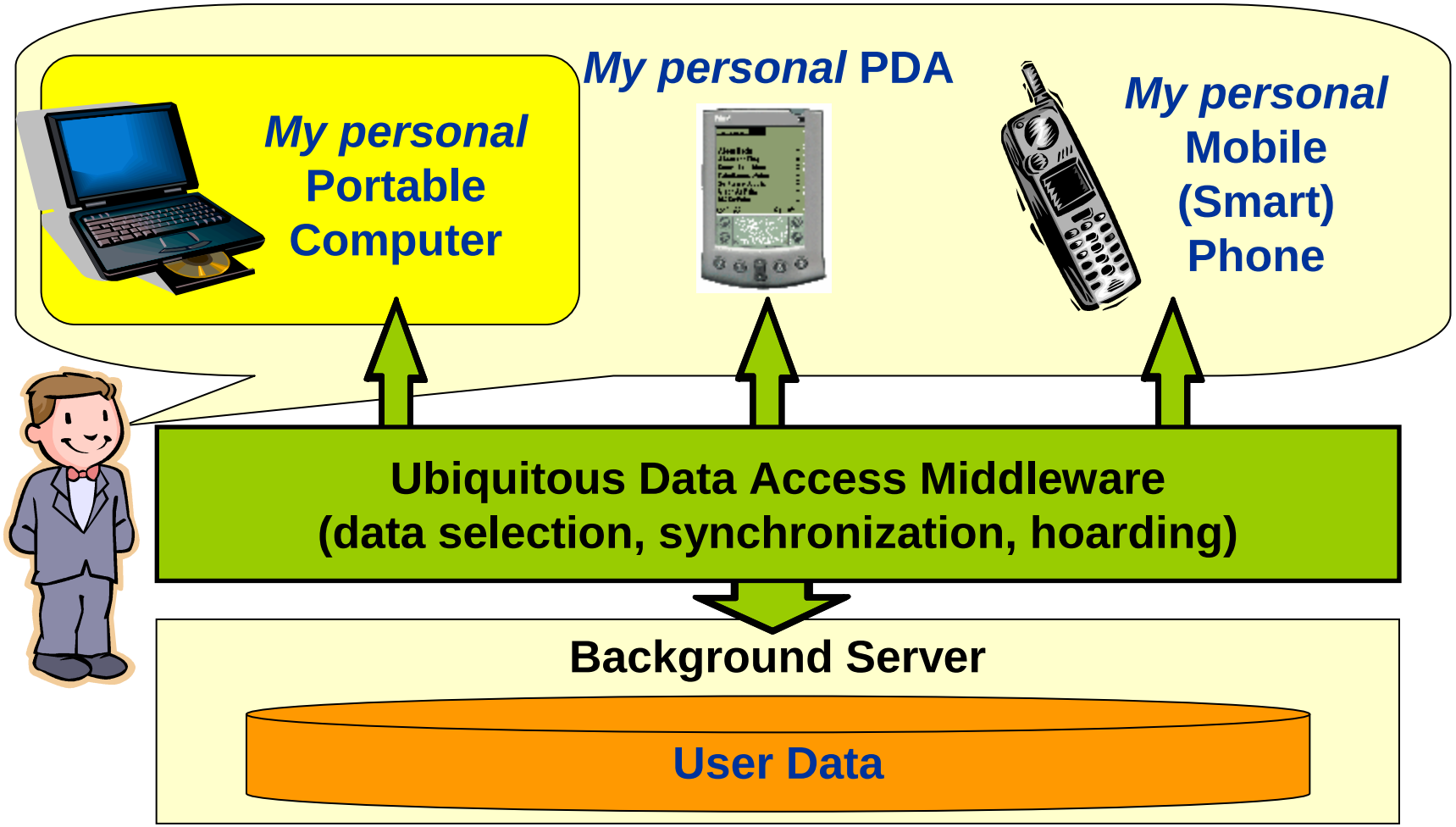

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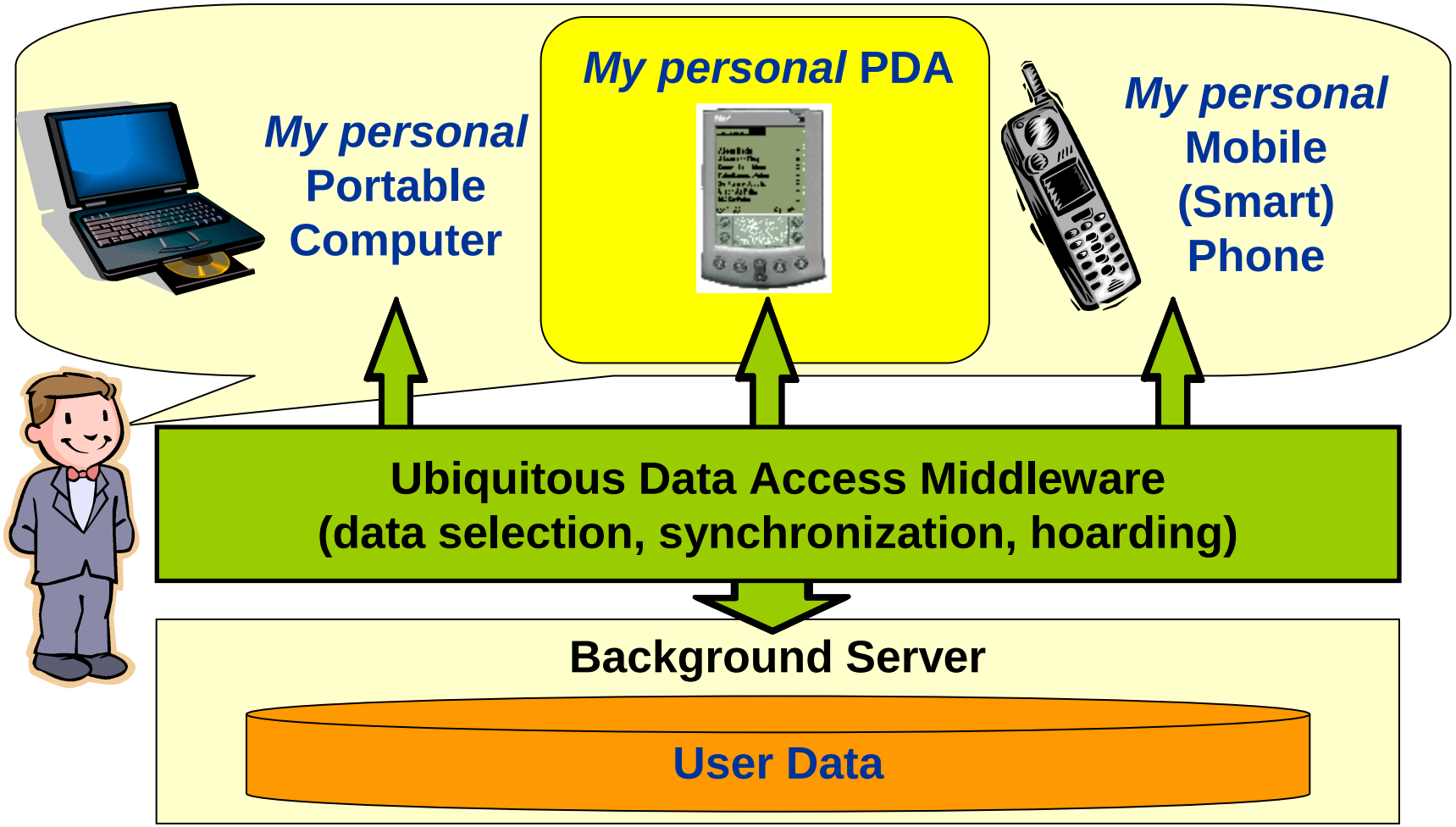

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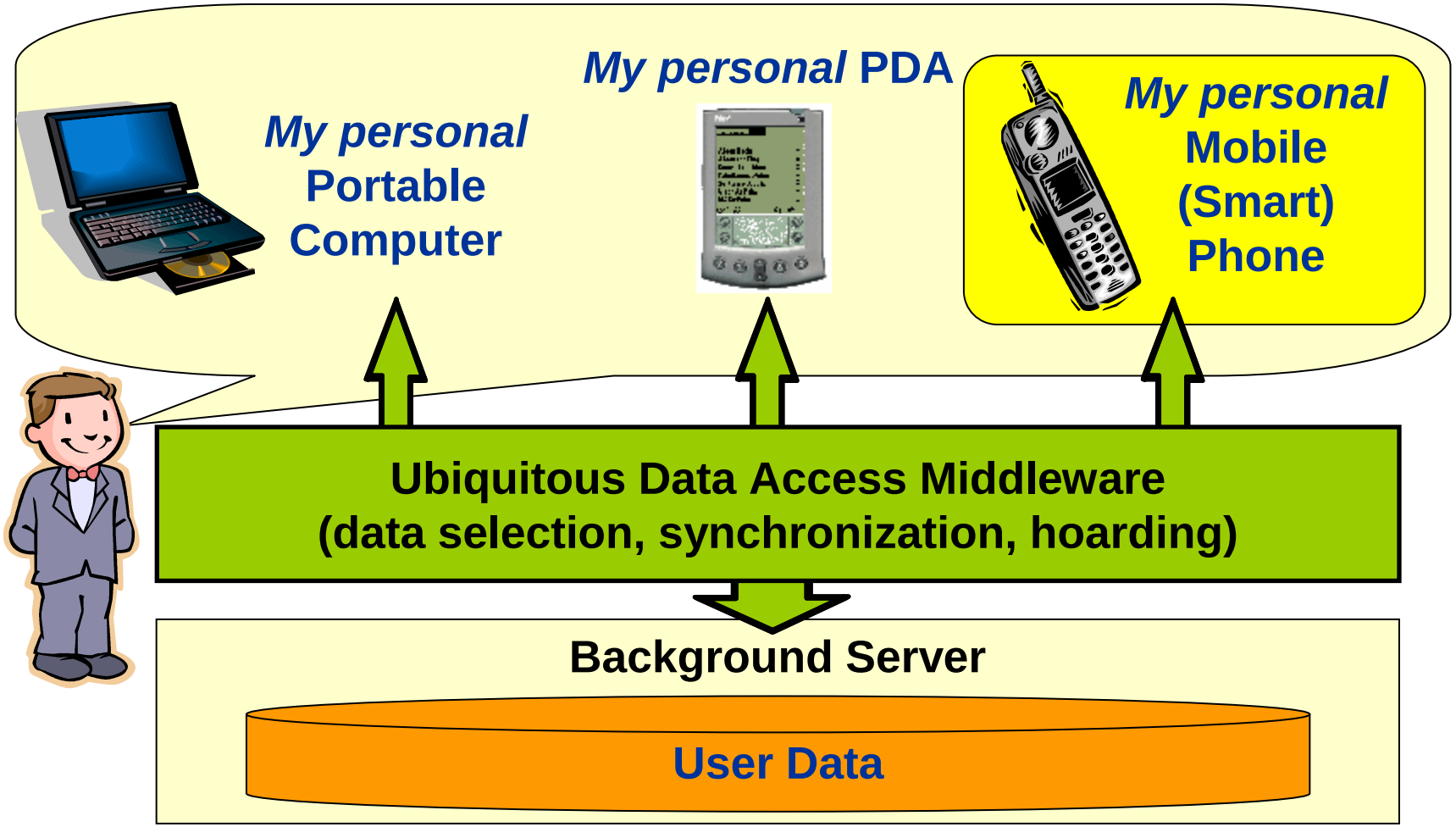

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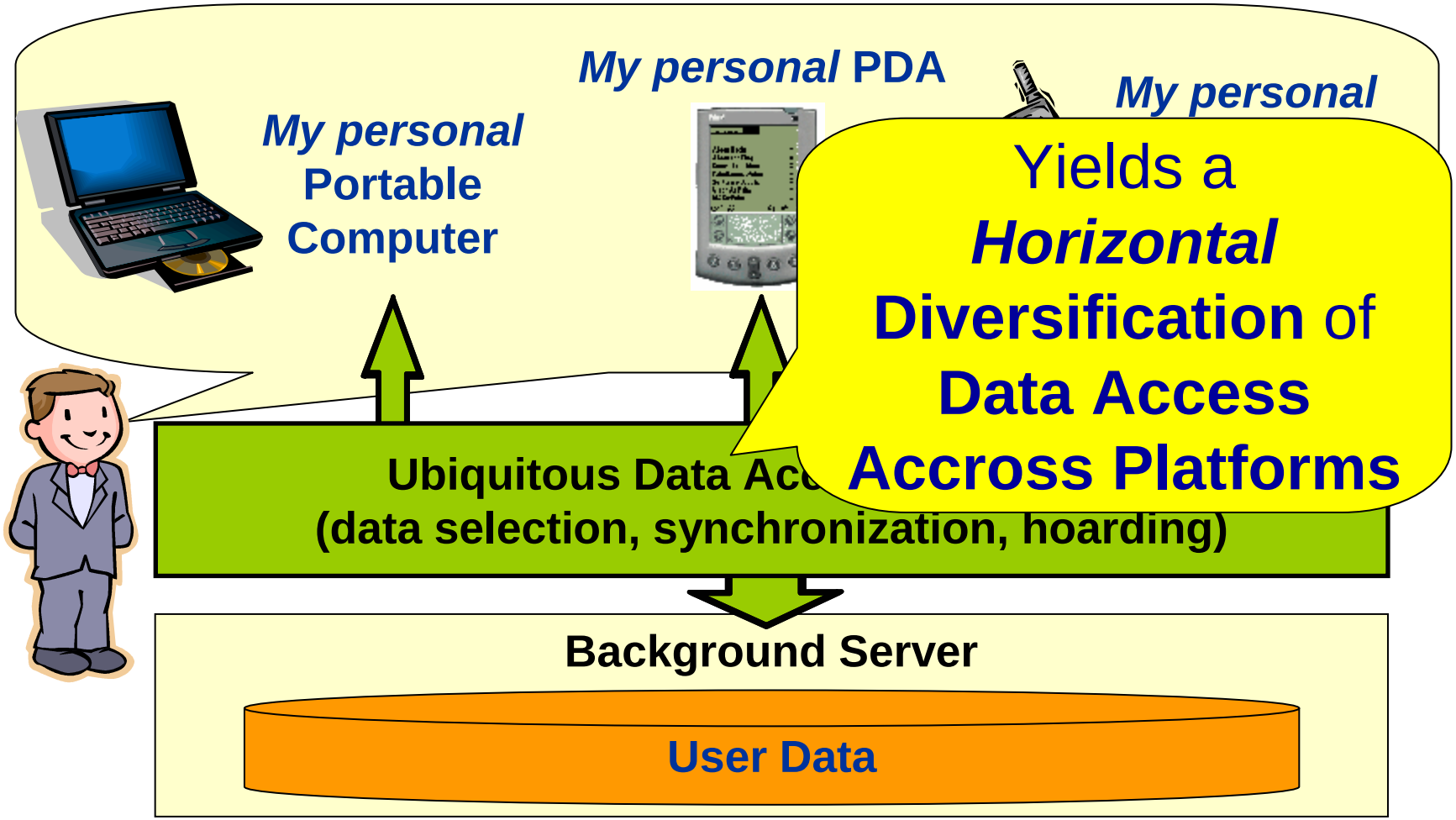
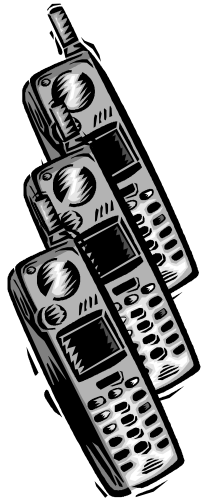


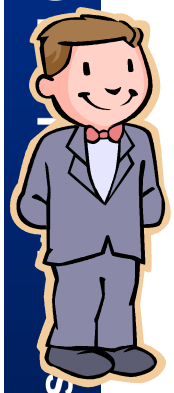
Instant Personalization

Any **Portable Computer**

Any **PDA**

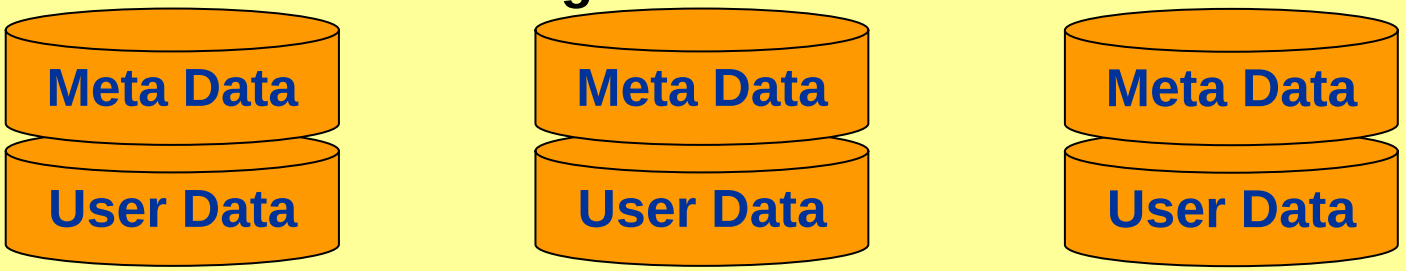


Any **Mobile (Smart) Phone**



Instant Personalization Service

Background Server



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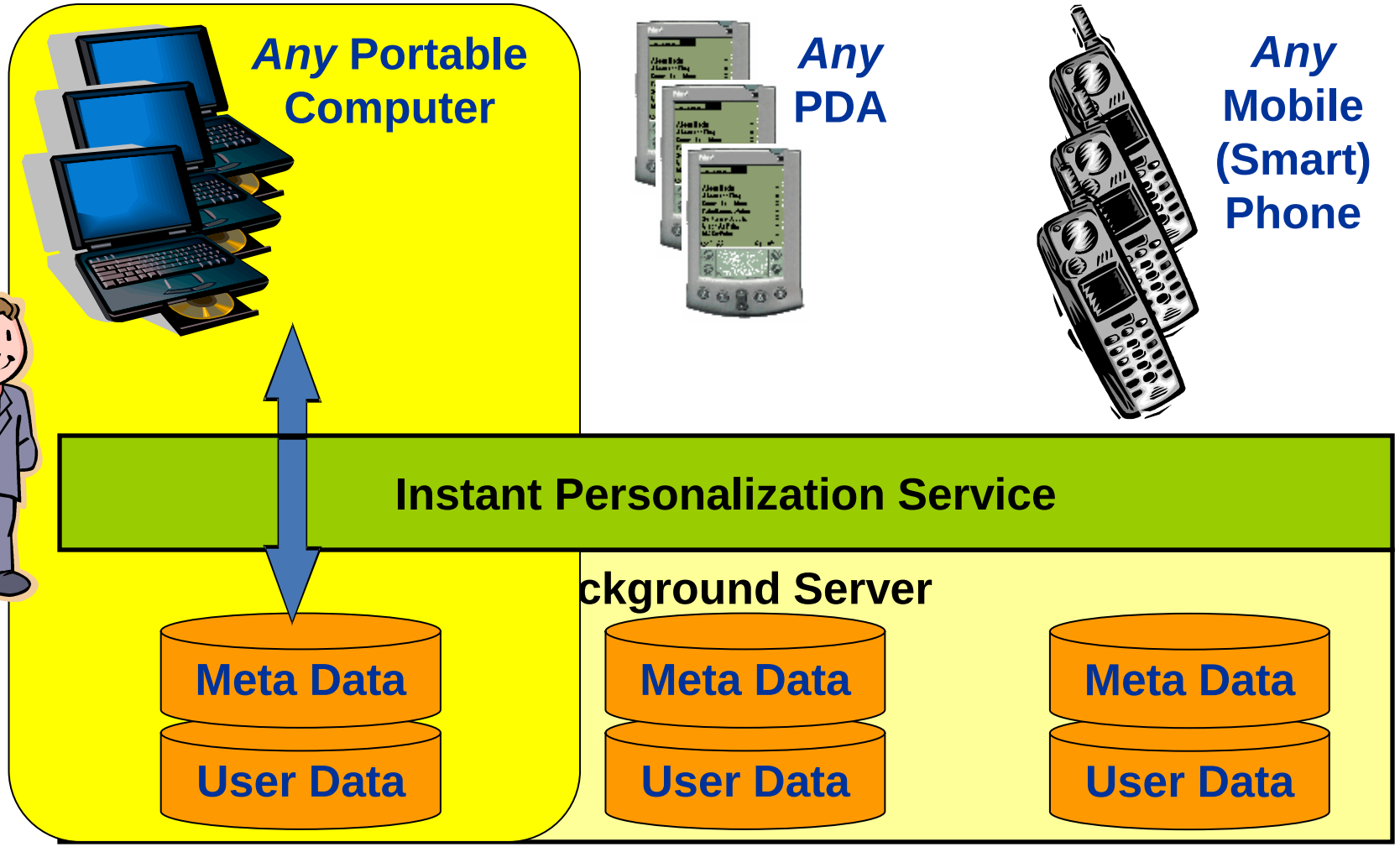

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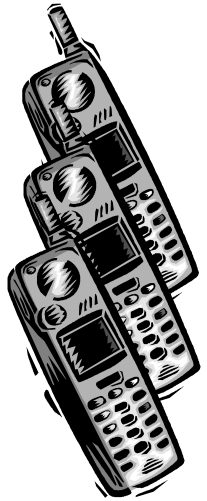

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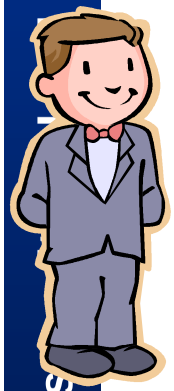

Instant Personalization Service

Ba

Meta Data

User Data

Meta Data

User Data

Meta Data

User Data

Instant Personalization

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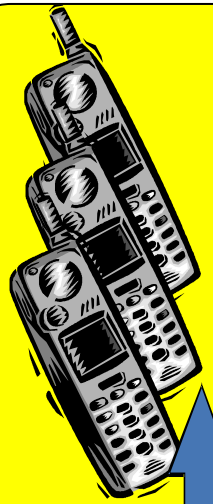
Any **PDA**



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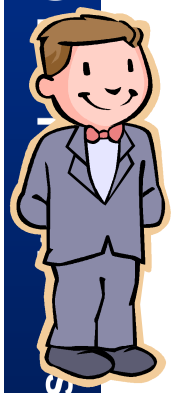


Instant Personalization Service

Background Server

Meta Data

User Data

Meta Data

User Data

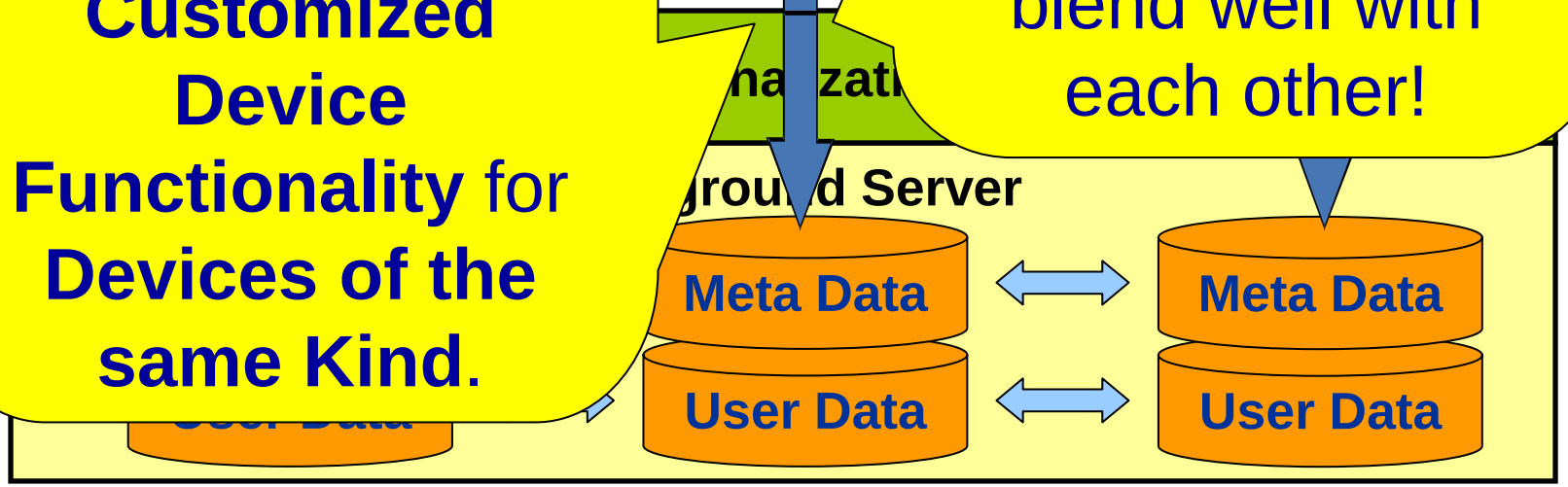
Meta Data

User Data

Instant Personalization

Yields a ***Vertical*** **Diversification** of Access to **Personal Data** and to **Customized Device Functionality** for **Devices of the same Kind**.

Horizontal and **Vertical Diversification** are **Orthogonal Concepts** that blend well with each other!



Outline

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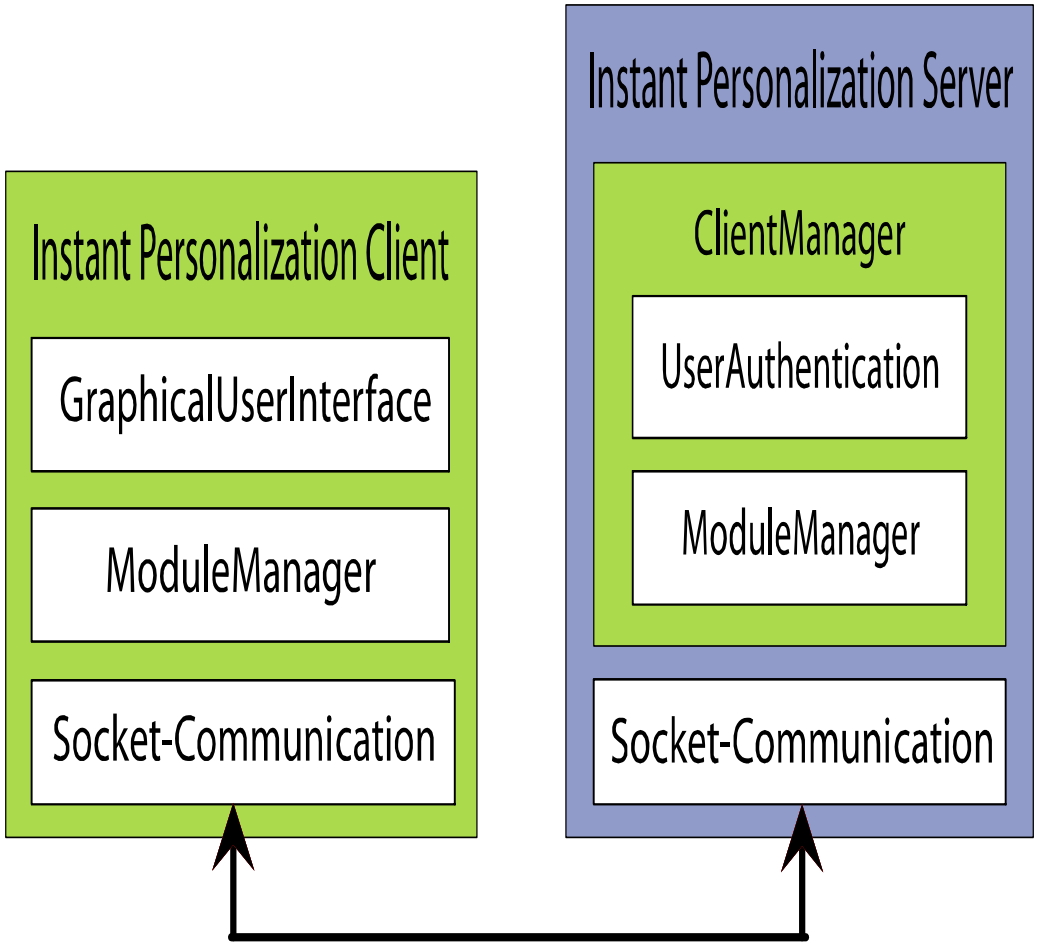
IP Prototype

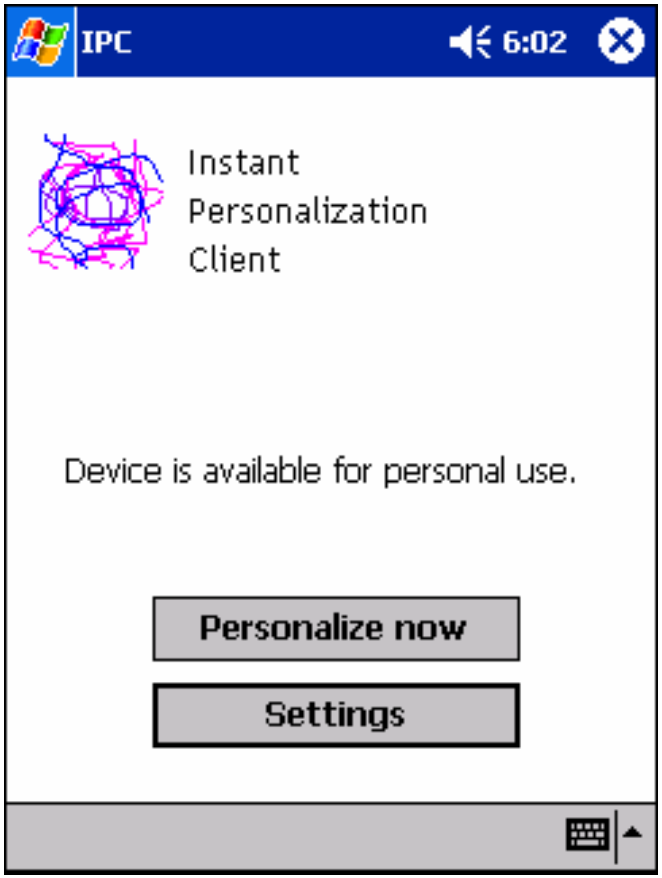
- Client: HP iPAQ H5450 with PPC 2002
  - Wireless LAN
  - fingerprint sensor
  - Visual C++ for Embedded v3.0
- Server: Windows XP computer
  - Visual C++ v6.0

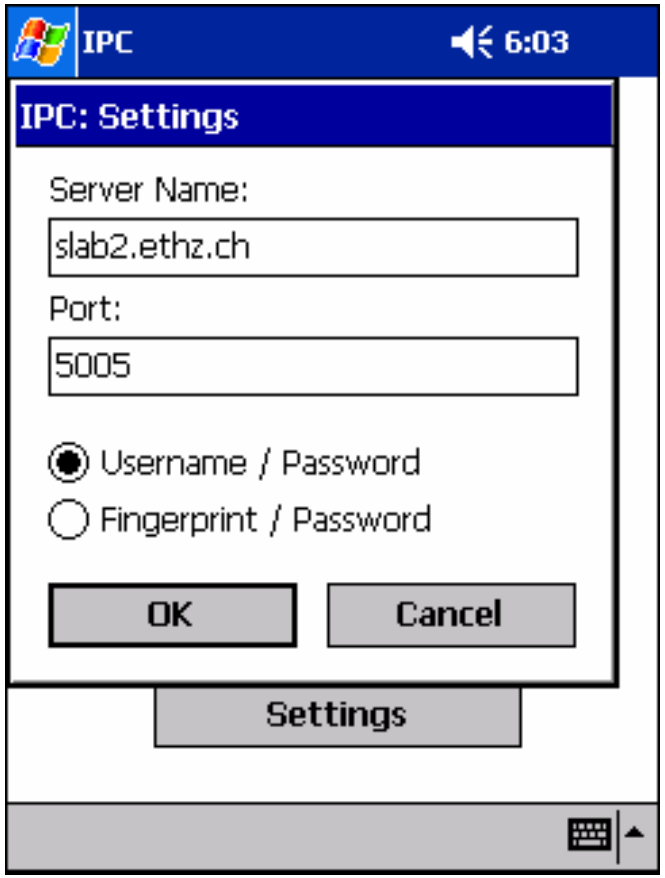


Prototype Status

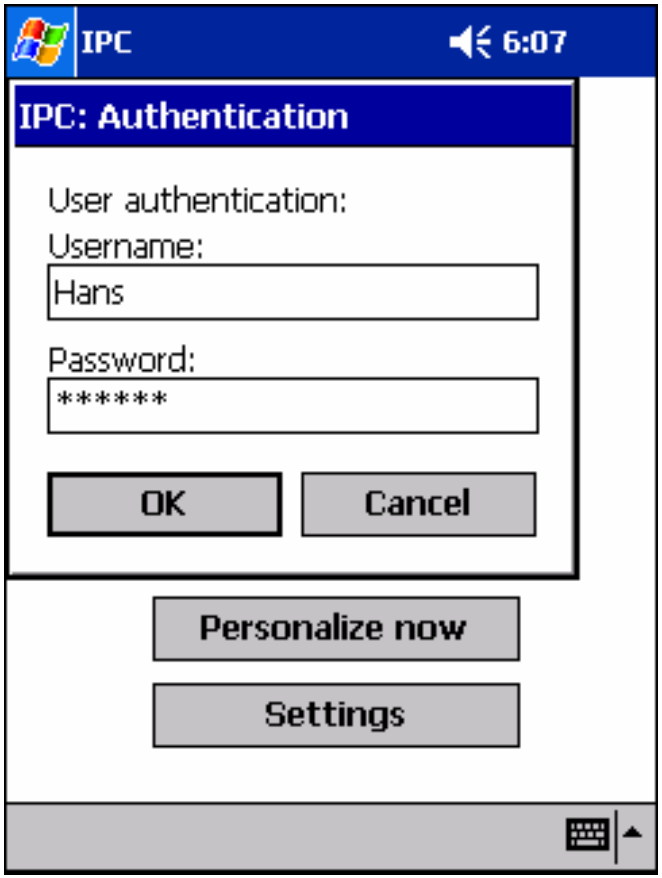
- Implemented personalization features:
  - tasks, contacts, calendar entries (POOM)
  - IMAP email settings (registry)
  - automatic and server-initated release
- Planned enhancements:
  - use fingerprint sensor for user identification
  - additional personalization modules
  - improve overall system stability and performance (& port software to PPC 2003)

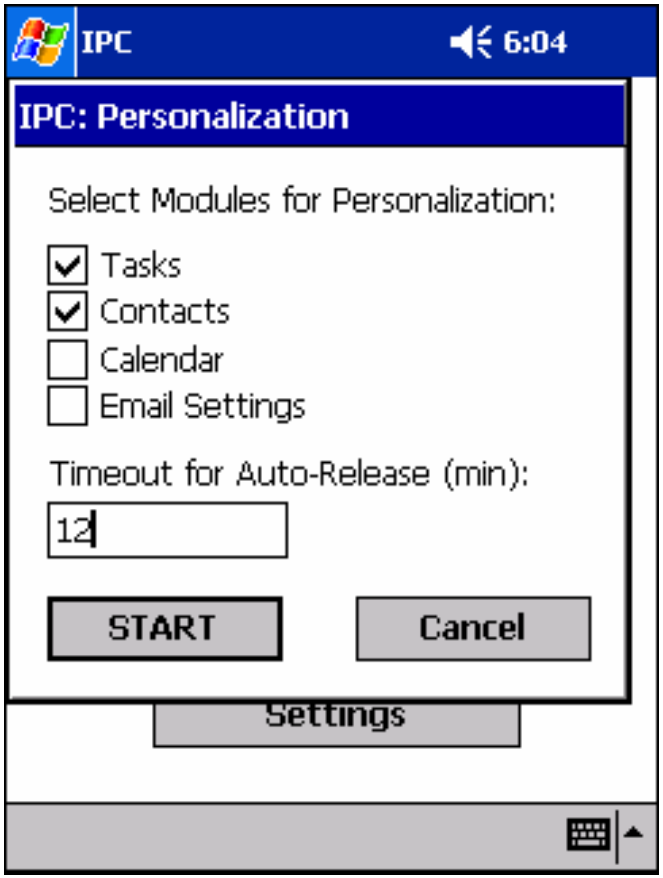
Screenshots: IPC



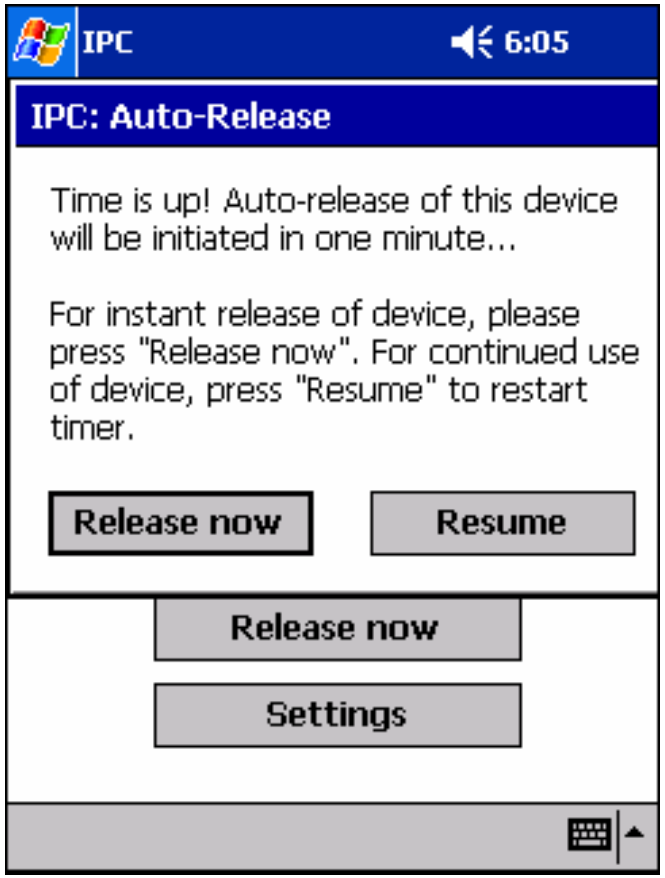


Screenshots: Logon





Screenshots: Release



Bandwidth Requirements

- Sufficiently high bandwidth available *[PDA ~600KB / e-Book ~2MB / Digicam ~20MB / Email ~200MB]*
  - UMTS: 144–384 Kb/s [13s/42s/7m/69m]
  - Bluetooth: 1 Mb/s [5s/16s/2m40s/27m]
  - WLAN 802.11b: 5.5 Mb/s [870ms/3s/29s/2m52s]
  - 4G Networks: 20-300 Mb/s [13ms/53ms/530ms/5.3s]
- Limiting factor is processing speed on handheld device (cpu power, memory operations)
- Latency may in some cases be reduced by means of progressive update propagation schemes

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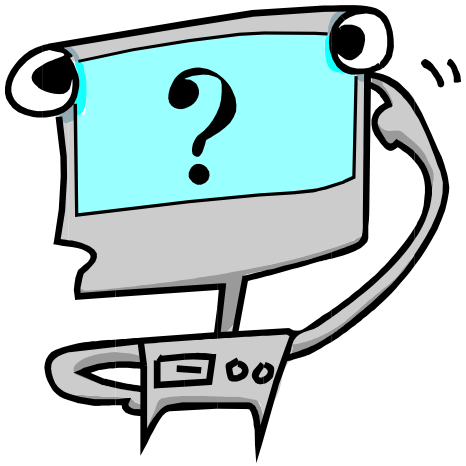
Conclusion

- Challenge: The importance of and dependence on cheap mass-produced handheld devices in society is rapidly growing (especially in the wake of mobile and ubiquitous computing)
- The concept of instant personalization helps to
  - reduce the user‘s dependence on individual devices
  - massively increase the accessibility of specialized functionality provided by personalized handhelds
  - improve the availability of personal user data
  - enable remote data recovery (and periodic backup)
  - protect confidentiality of personal user data

The End

- Questions and answers

(later in the panel session)



- Contact: Juergen Bohn, ETH Zurich
  Email: bohn@inf.ethz.ch
  Web: www.inf.ethz.ch/~bohn/

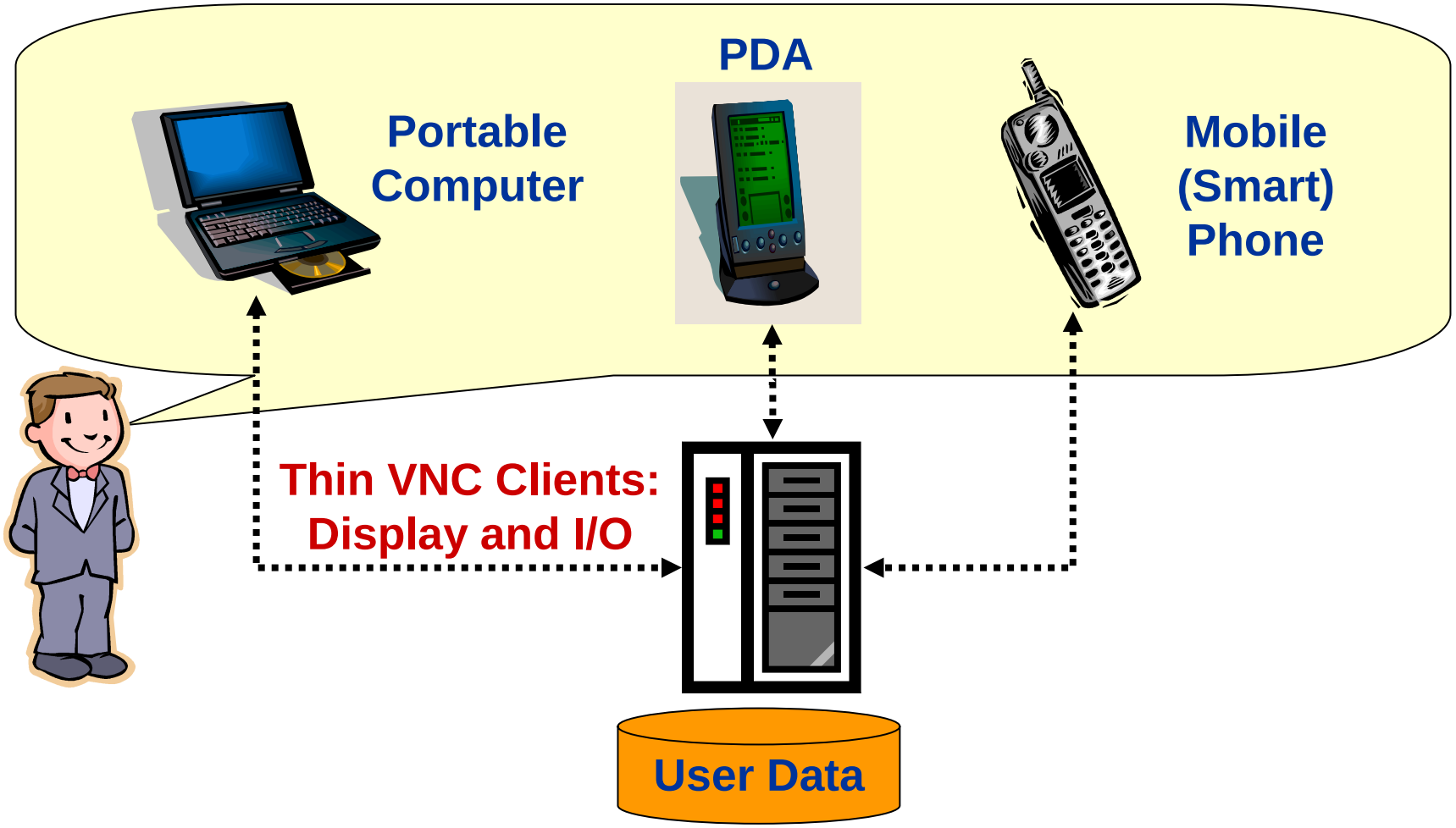
Q & A

Just in case…

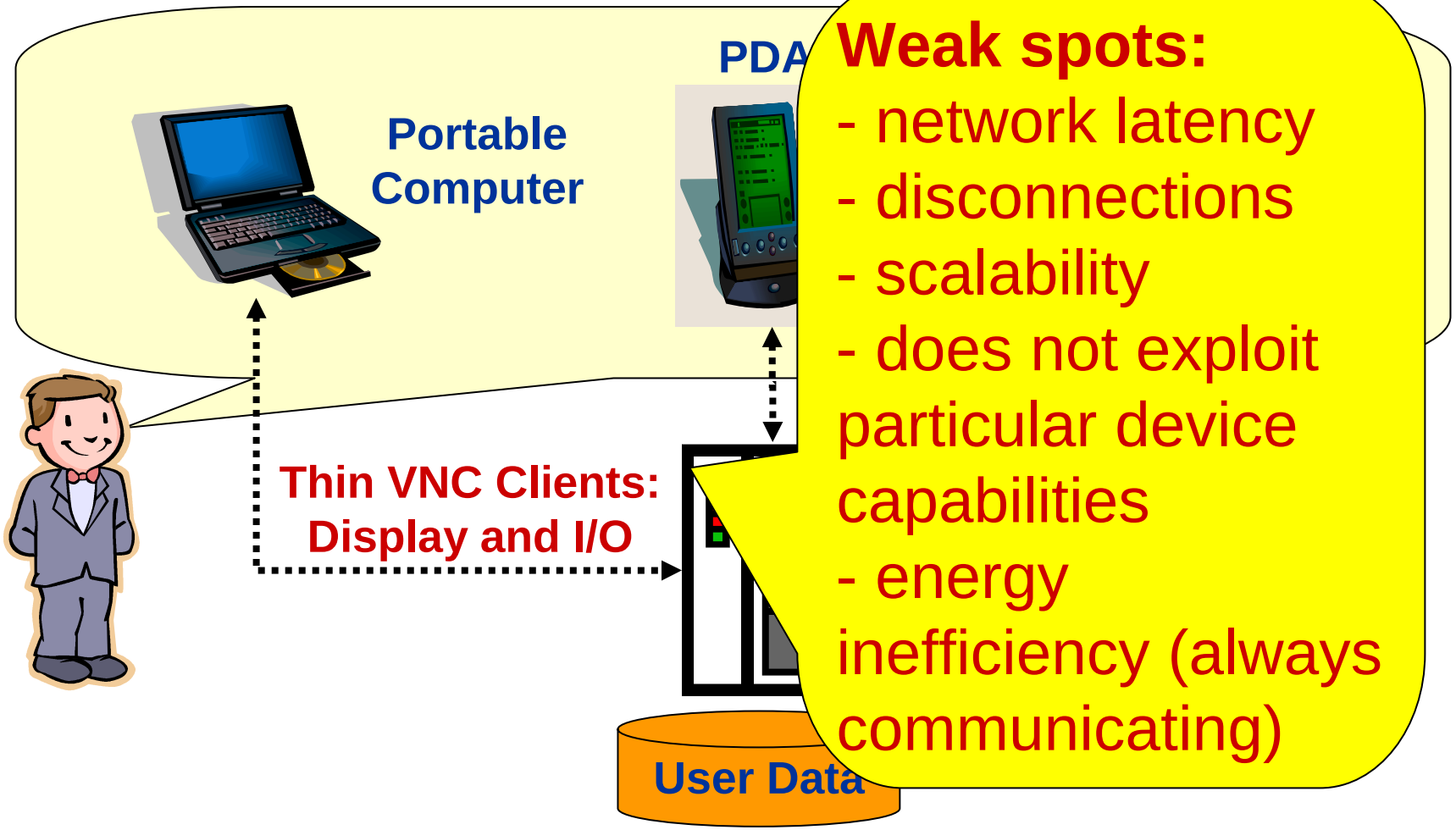
- Instant Personalization versus
  - the Virtual Network Computing concept
  - the Personal Server concept

Extras

Virtual Network Computing

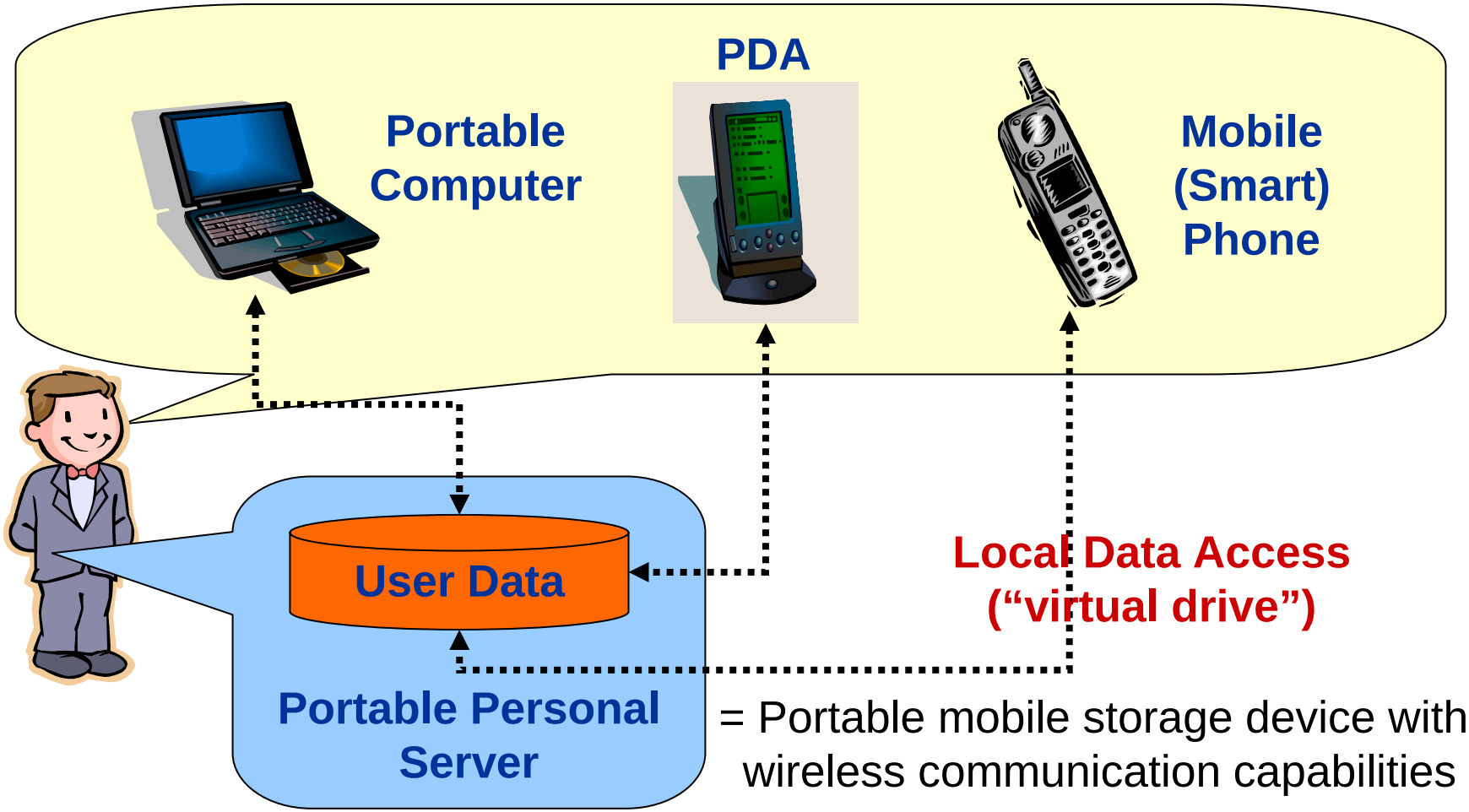


Virtual Network Computing



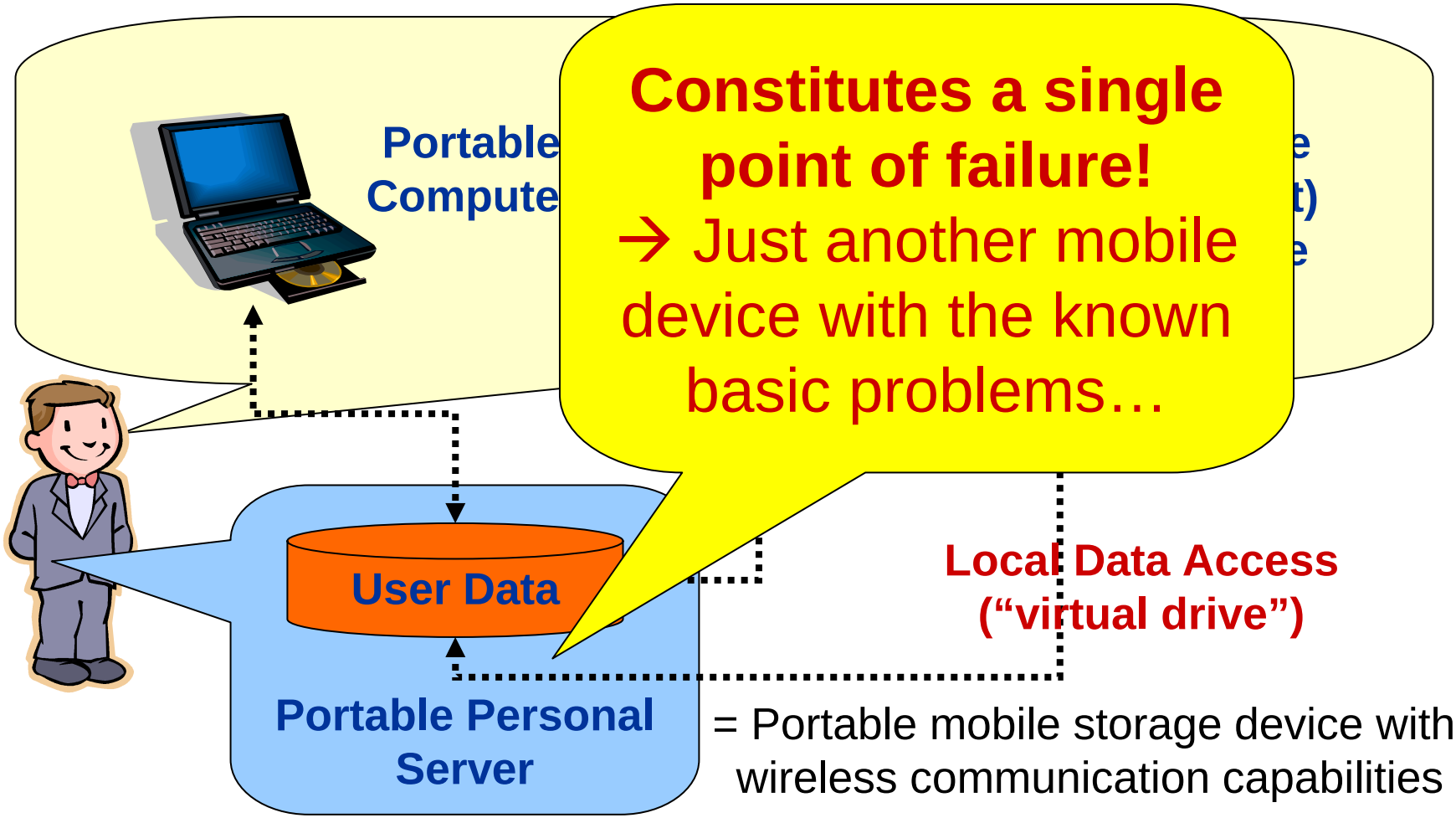
Weak spots:
- network latency
- disconnections
- scalability
- does not exploit particular device capabilities
- energy inefficiency (always communicating)

Personal Server Concept



= Portable mobile storage device with wireless communication capabilities

Personal Server Concept



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