Challenges on Services

Guadalupe Ortiz Bellot
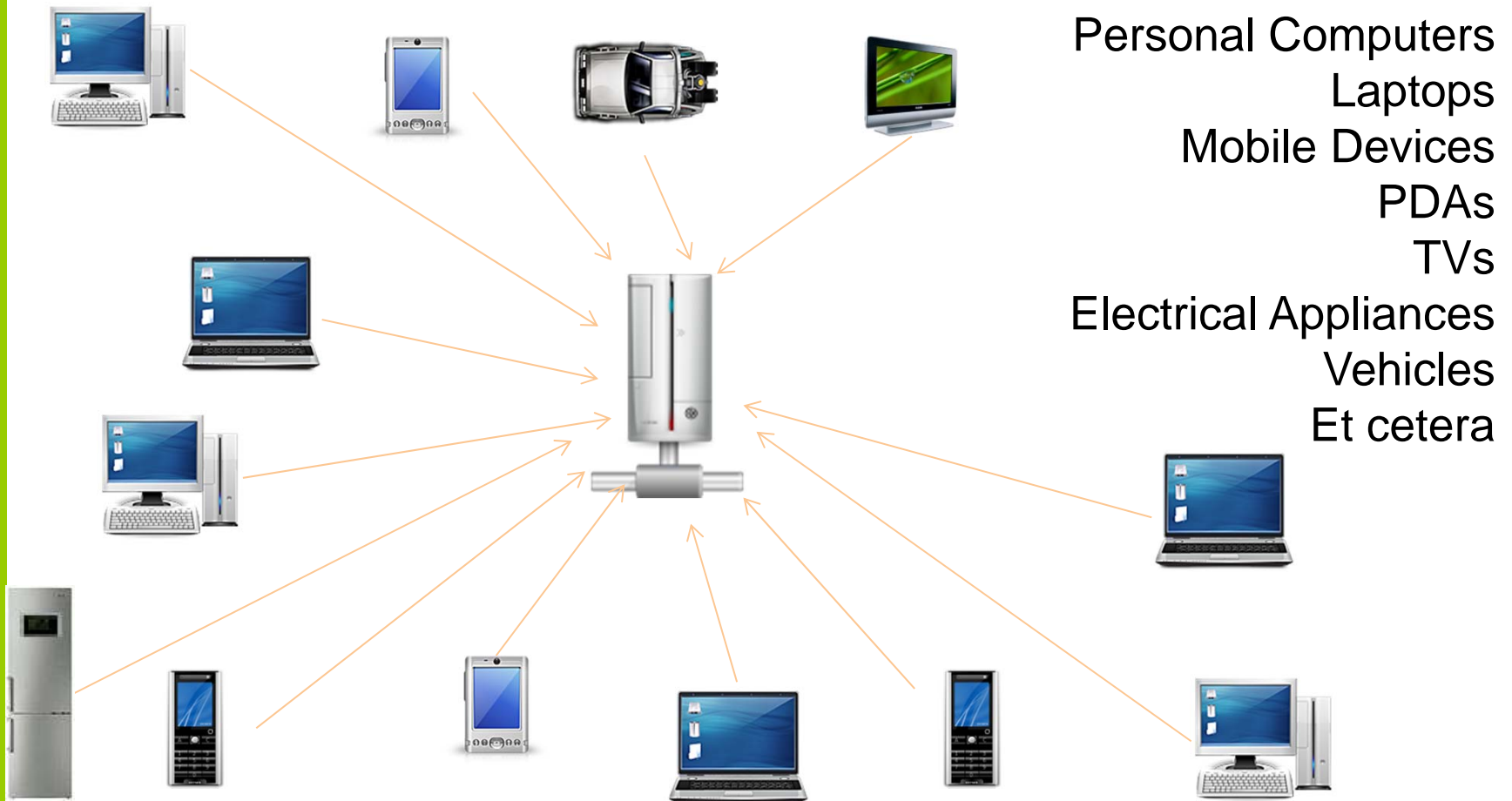
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Outline

- Challenge 1:

  Devices Evolution → Services Evolution

- Challenge 2:

  Mobiles Evolution → Services Evolution

- Challenge 3:

  Business Evolution → SOAs evolution

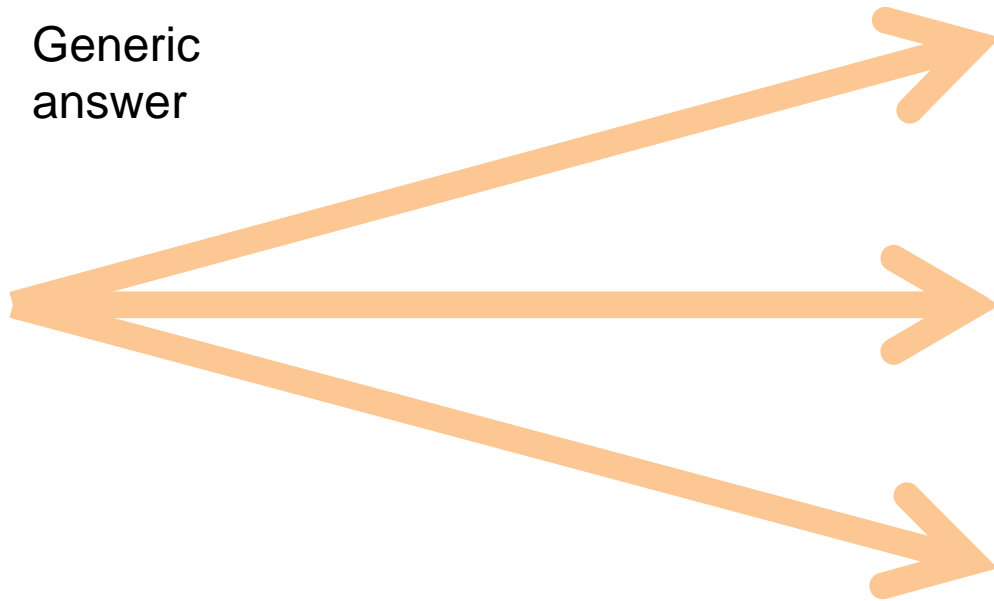# DEVICES EVOLUTION → SERVICES EVOLUTION (I)

Personal Computers
Laptops
Mobile Devices
PDAs
TVs
Electrical Appliances
Vehicles
Et cetera

DEVICES EVOLUTION → SERVICES EVOLUTION (II)

Adapting to the device type

Adaptation

Generic
answer

Invocation

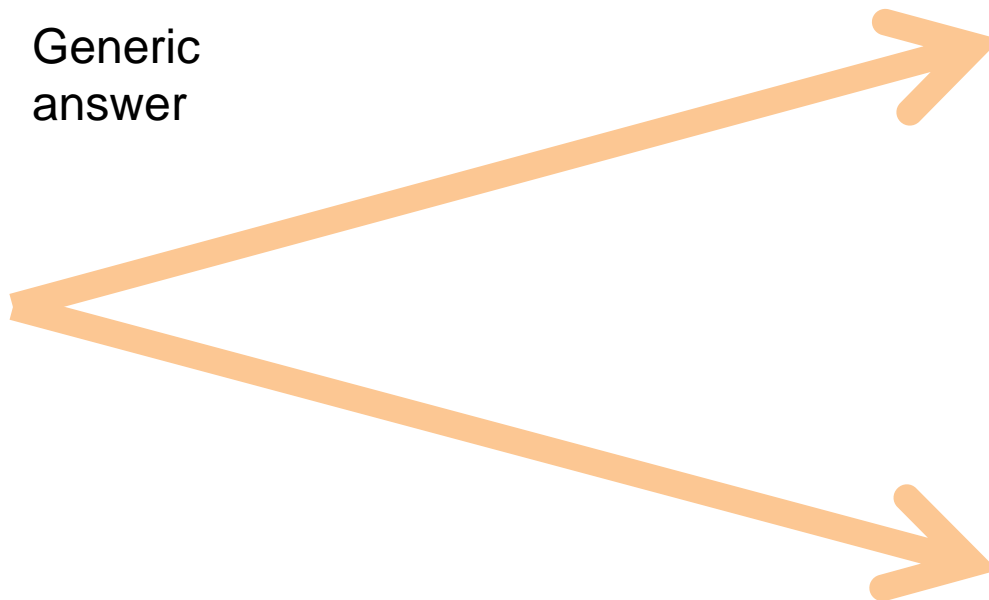# MOBILES EVOLUTION → SERVICES EVOLUTION (I)

MOBILES EVOLUTION → SERVICES EVOLUTION (II)

Adaptation

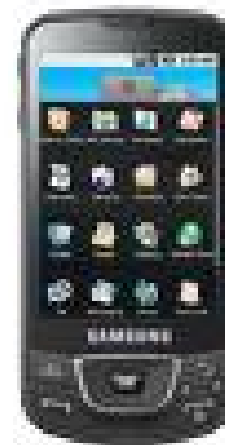**Adapting to the device model and user preferences**
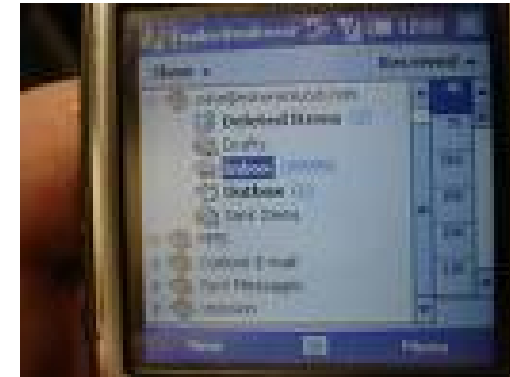
Generic
answer

Invocation

MOBILES EVOLUTION → SERVICES EVOLUTION (III)

MOBILES EVOLUTION → SERVICES EVOLUTION (IV)

- Giving them **as much** services **as possible**

- **Adapting** these **services** to mobile devices **properly**

- Making devices **aware of user context**

BUSINESS EVOLUTION → SOAs EVOLUTION (I)

Event

Generic answer

Invocation.
Tourist
information?

Adaptation

BUSINESS EVOLUTION → SOAs EVOLUTION (II)

OR

AND

detected

Avian influenza suspect case
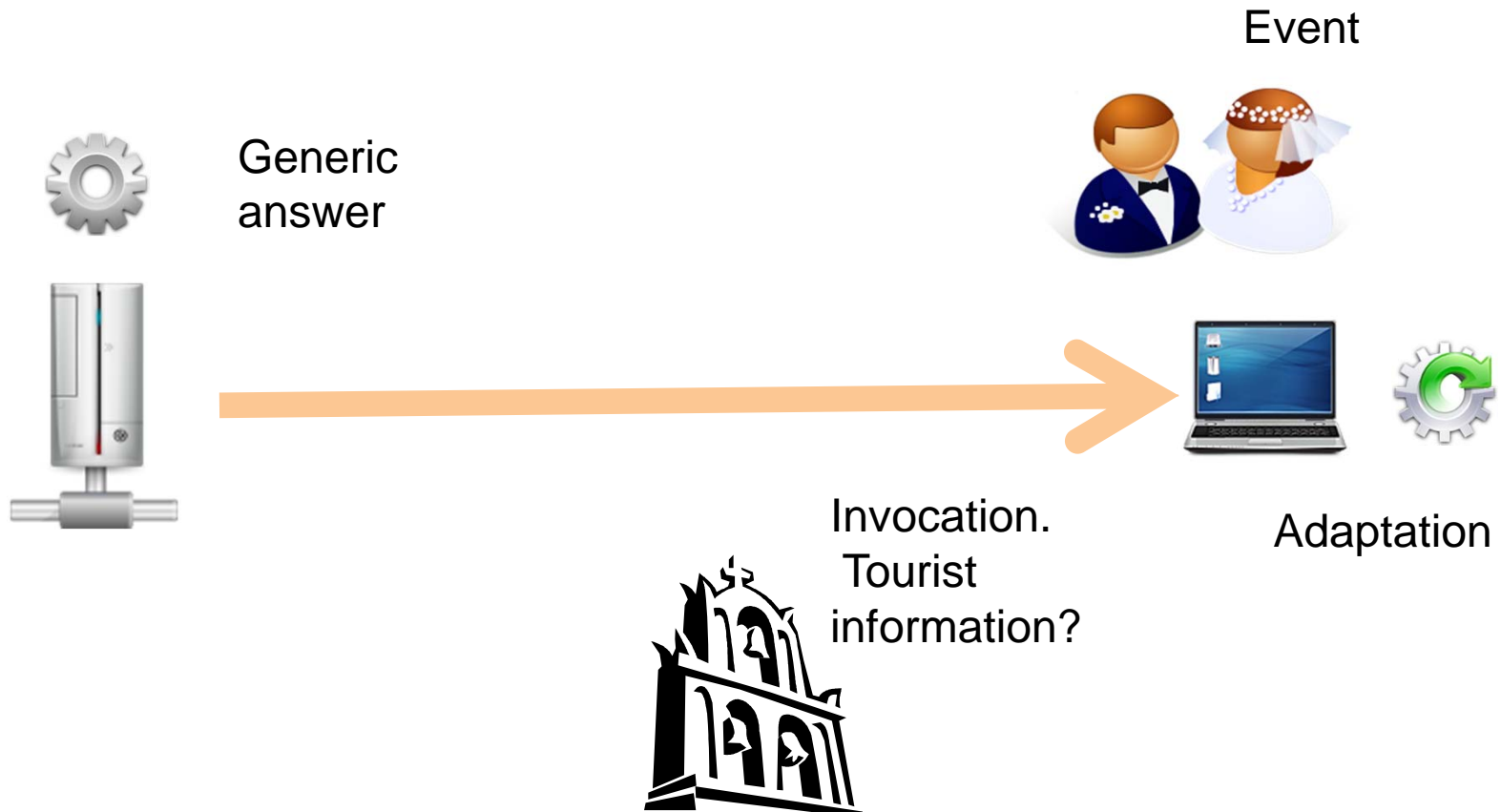
Complex event

Complex event pattern

Remarks

- Challenge 1:

  Devices Evolution → Services Evolution

- Challenge 2:

  Mobiles Evolution → Services Evolution

- Challenge 3:

  Business Evolution → SOAs evolution

Thanks for your attention!

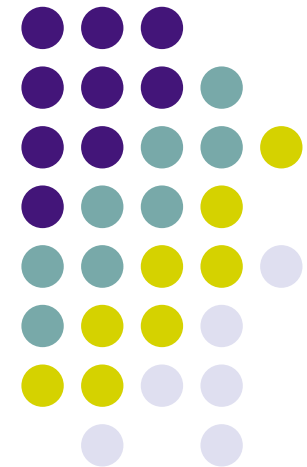# Elastic Clouds Enable Intelligent Applications

Panel on Cloud Computing Challenges
Cloud Computing 2011

Sep. 26, 2011

Peter Van Roy

Université catholique de Louvain
Louvain-la-Neuve, Belgium

Elastic Clouds Provide Massive Resources at Low Cost

r (resources)

$$r \cdot t \leq c_0$$

Elastic resources

r_0

Local resources

t_0

t (time interval)
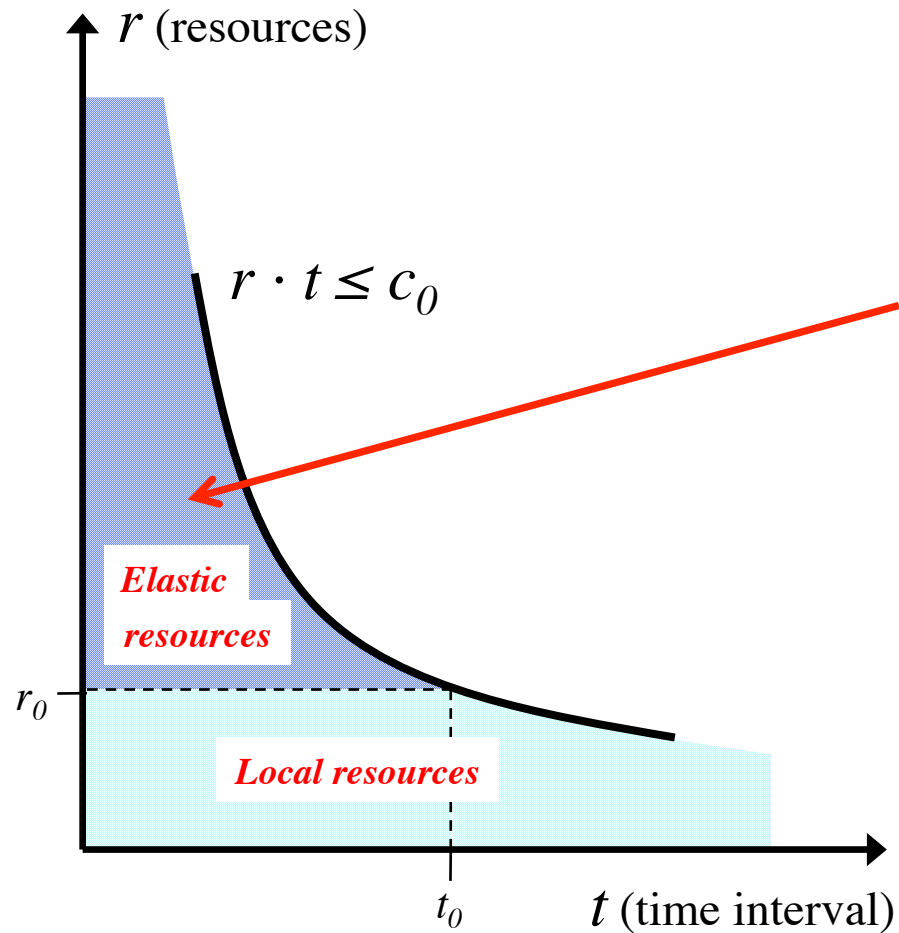
- Elasticity is the ability to ramp up resources quickly to meet demand
  - Like electric power distribution
- With elastic clouds the enormous **dark blue area** becomes available
- Applications that need enormous resources for short times can get them for low cost!
  - Like electric power distribution, you pay only for the volume (cost is product of time and number of machines)
  - This is exactly what intelligent applications need!

The "Next Internet Revolution": Elastic Applications

Internet abstraction level

"Elastic Applications"

Social Networking & Commerce

Web & Search

Email & Usenet

TCP/IP

Year

1970   1980   1990   2000   2010   2020
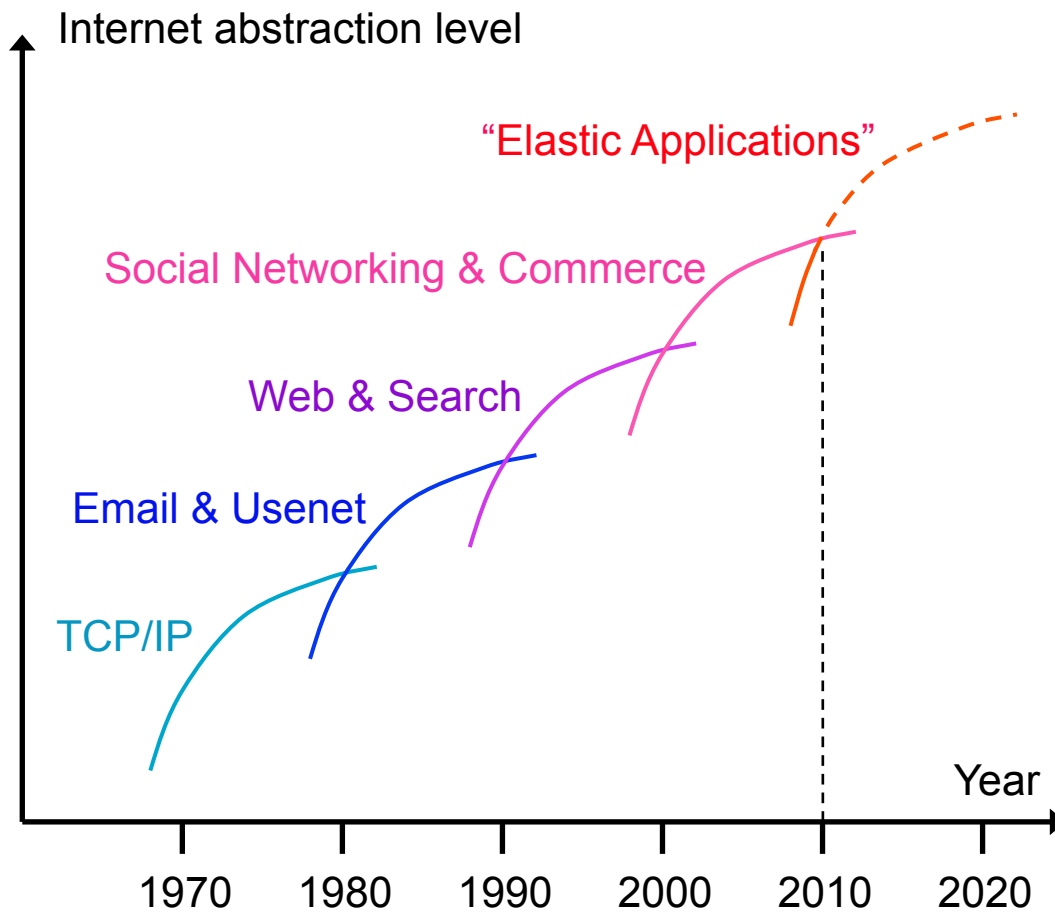
- The Internet has gone through four revolutions since its inception
  - Each revolution takes about ten years to be internalized
  - Old timers like me saw many of them (I started using it in 1983)
- We are now on the brink of a fifth revolution fueled by elasticity and based on a combination of cloud computing and data-intensive algorithms
  - Applications that use massive resources in short bursts can be run at low cost
  - Large-scale machine learning will be used heavily

3

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Intelligent Applications need Elasticity

Learning/setup phase
elastic resource requirements
(learning time constraints)

XL
Tomorrow's applications

Real-time audio language translation

L

Advanced applications

Weather forecasting

Recorded Future

Real-time expert guidance

Creative problem solving (tamed search)

Standard applications

M

Google Search
Google Translate
Recommendation sys.
Speech recognition
Skype connection
Social networks
Media translation

Wolfram Alpha
Image recognition

Championship chess (Deep Fritz)
IBM Jeopardy (Watson)

Intelligent augmented reality

S

BitTorrent
WIMP GUI
Microsoft Office

Computer algebra
Peer-to-peer CDN
Google Earth
JIT Compiler

MMORPG
Role-playing games
Chess programs

S   M   L   XL

One-shot

One-way stream

Conversation

Interactivity (learning + query)

Query/use phase
elastic resource requirements
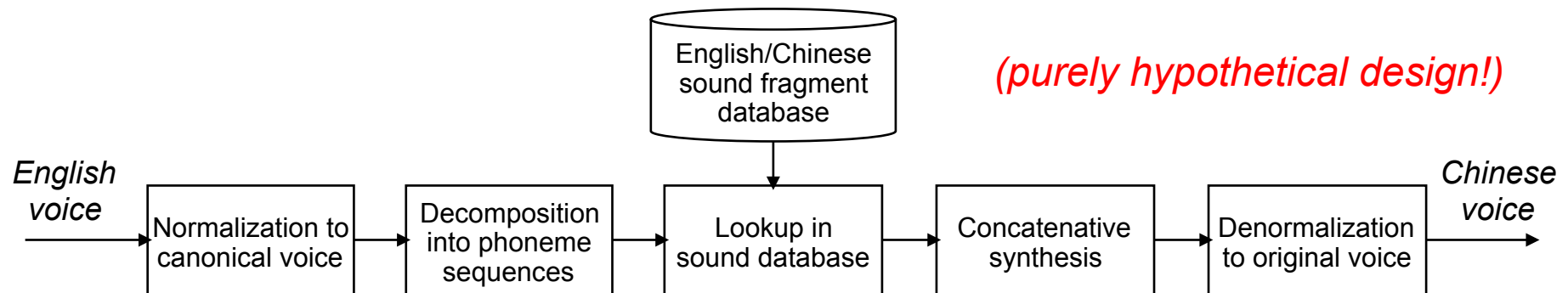(response time constraints)

An Elastic Application: Real-Time Voice Translation

- The pieces of this application already exist; for example the IRCAM research institute has implemented many of them

- It requires combining domain knowledge (in sound and language) with an enormous sound fragment database, hosted on a cloud

(purely hypothetical design!)

Performance will be gradually improved through feedback from bilingual speakers and speech recognition technology

Google is working on this since 2010 (announcement by Franz Och, head of translation services at Google, on Feb. 10, 2010)

Some More Applications…

- Real-time audio language translation
  - Google is already working on this (announced Feb. 2010)!
  - Full media interchangeability (text, audio, image, video)
- Knowledge extraction from raw data
  - A huge amount of raw data already exists in digital form: 1.2×10^{21} bytes (2010)
  - Learning algorithms based on large corpora, inferencing, and canonical forms
- Expert guidance (a form of augmented reality)
  - Guiding humans interactively in real time to perform expert tasks
  - For example, anyone can become an expert car mechanic
- Creative problem solving (tamed brute force search)
  - Combining information to provide useful solutions to human-specified problems
  - The exponential search is tamed by learning algorithms
- Continuous fluid interaction
  - No detours through WIMP GUIs; direct interaction with detailed immersive reality
  - Not programmed, but learned by example and user feedback

6

Agents, Mobile Devices, Context Awareness, Adaptation, Intelligence, Control, and Decision-making

Kendall E. Nygard

North Dakota State University

Wireless connections will more than double to 3 billion+ in about 2 years!

The Application-Centric View

- The predominant approach by companies selling apps
- Apps are not normally aggregated
- When people work, considerable shifting among apps is often necessary
- Extensive personalization is called for

Personalization

- Gear the user experience toward how people use devices versus rather than around an app
- Smarter devices
- Engage ecosystems of knowledge
- Device synchronization
- App aggregation (e.g., flights, transportation options, hotels, entertainment, dining, online-payments, local information)

SmartPhones Allegiance

- 75% fall asleep with their phone
- 69% are more likely to leave their wallet behind than their phone
- 41% said that losing their phone would be tragic
- 30% regard the iphone as their "doorway to the world."
- 25% regard the iphone as "dangerously alluring"

More SmartPhone Allegiance

- 9% have patted their phone
- 3% let nobody else touch their phone
- 3% have named their phone
- 8% of Iphone users thought that their Ipod was jealous of their iPhone
- Many want to be Buried with their Smart Phone when they Die

Reactiveness and Directedness

Reactiveness is achieved by a set of behaviors

Directedness identifies and exploits structure, maintains a knowledge base, and accesses system knowledge to advantage

Personalization using Agents for…

- Monitoring resources
- Aggregate apps
- Managing context
- Initiating configurations of other agents
- Match and adapt content and logic from remote services
- Learn and anticipate
- Manage concurrency
- Monitoring the user profile/preferences
- Synchronizing protocols for inter-agent communication and consultation
- Negotiating conflicts among agents
- Managing and customizing user interaction
- Adapting the interface to the device
- Balance local autonomy with global consistency and control via remote services
- Synching with laptop, notebook, or other devices
- Managing policies
- Integrating geolocation
- Providing security