



Centre de Recherche Public  
**Gabriel Lippmann**

Management of Info. flows in AEC projects

*CIB W78 20th International Conference  
Information Technology for Construction  
Auckland, New Zealand*

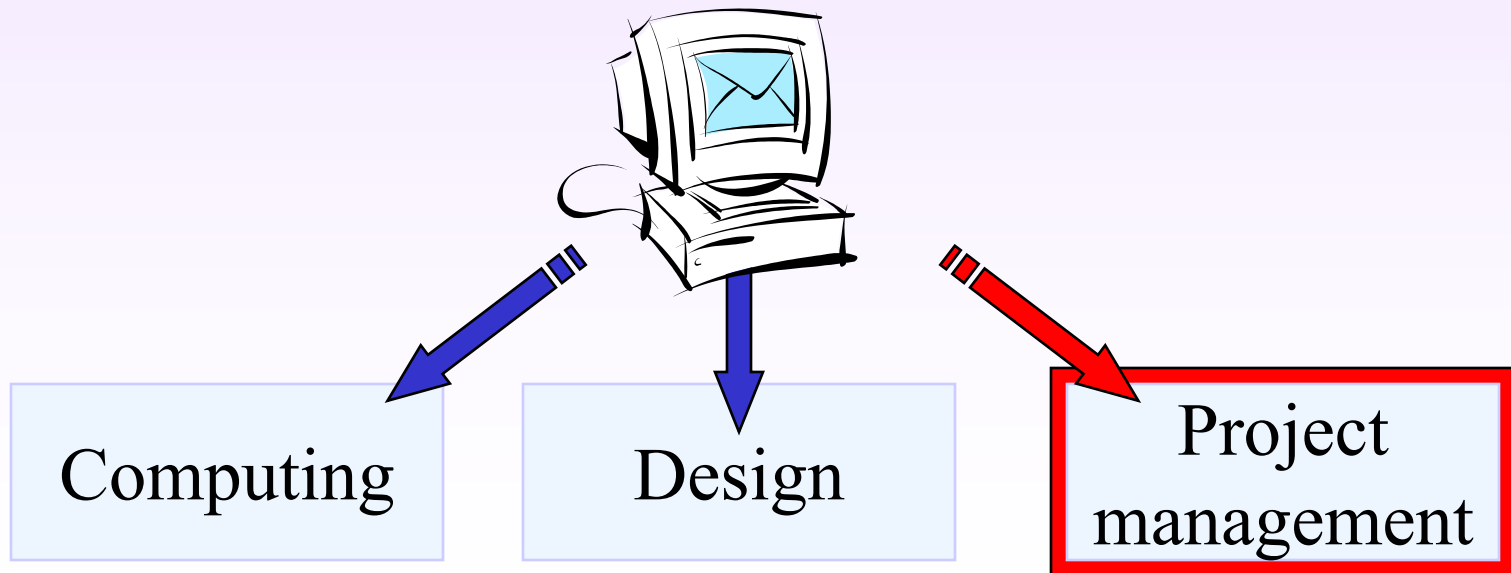
Management of information flows  
During construction projects

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Public Research Centre-Gabriel Lippmann  
Luxembourg*



## 1. Introduction

Appropriate management of information is  
a competitive advantage





## 2. Information exchange

Technology



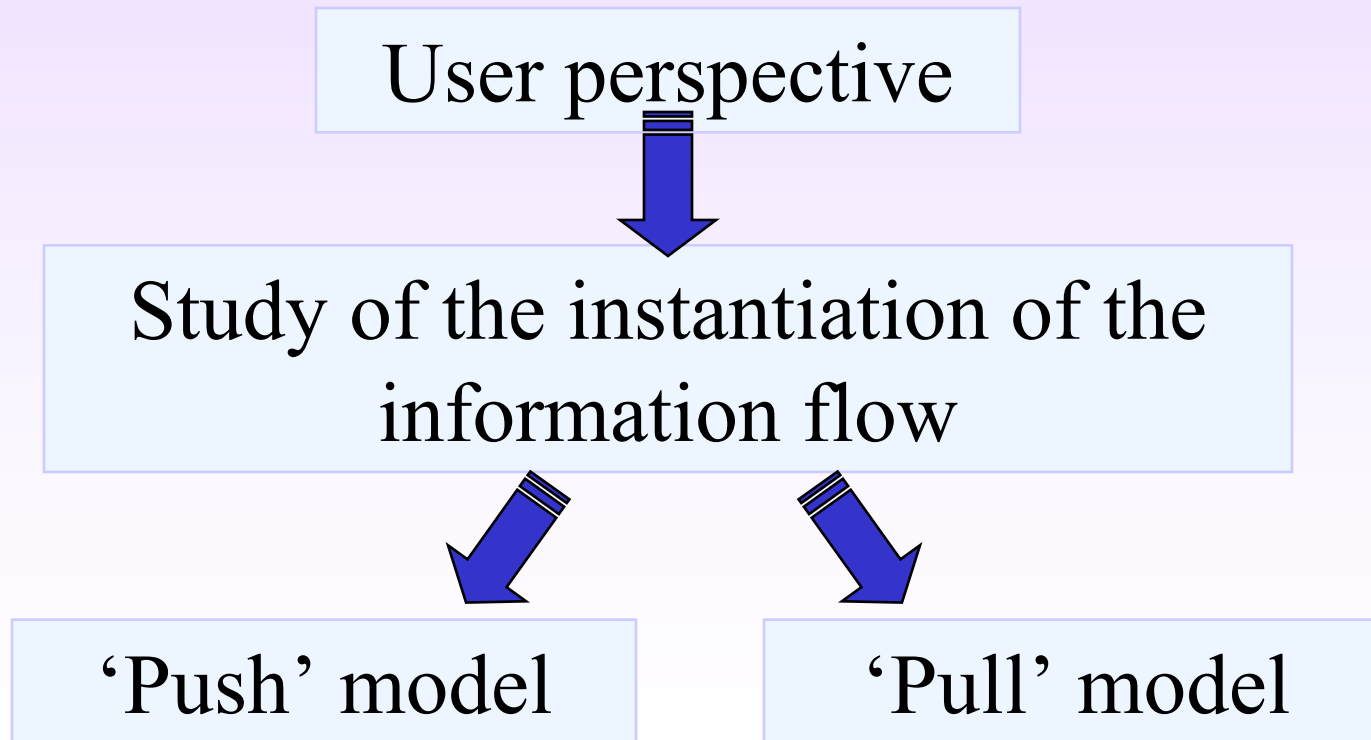
User perspective

*e-mail – SMTP*  
*Web – HTTP*  
*FTP*  
*Telephone*  
*Mobile phone*

Right information  
to the right person  
at the right moment



## 2. Information exchange





## 2. Information exchange

‘push’ model

**At which layer ?**

- data sent from the server to the client without specific request
- automatic mechanism for getting info. off the web
- new info. is delivered or retrieved automatically from a remote computer to the PC
- delivery of info. initiated by the info. server rather than the client
- prearranged updating of news [...] on a computer user's desktop interface through periodic, unobtrusive transmission
- ...



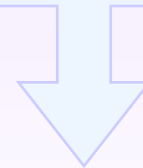
## 2. Information exchange

‘push’ model  
Passive user  
(*information reception*)



« Any info. flow that occurs  
without explicit request of the  
person that receives it. »

‘pull’ model  
Active user  
(*information retrieval*)

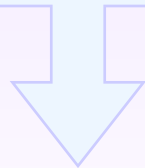


« Any info. flow that occurs as a  
consequence of an explicit  
request of a person. »



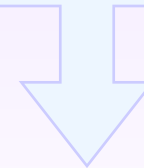
## 2. Information exchange

‘pull’ model  
*Active user*  
(*information retrieval*)



- seaching a phone book
- looking at an airport info. panel
- surfing on the web
- ...

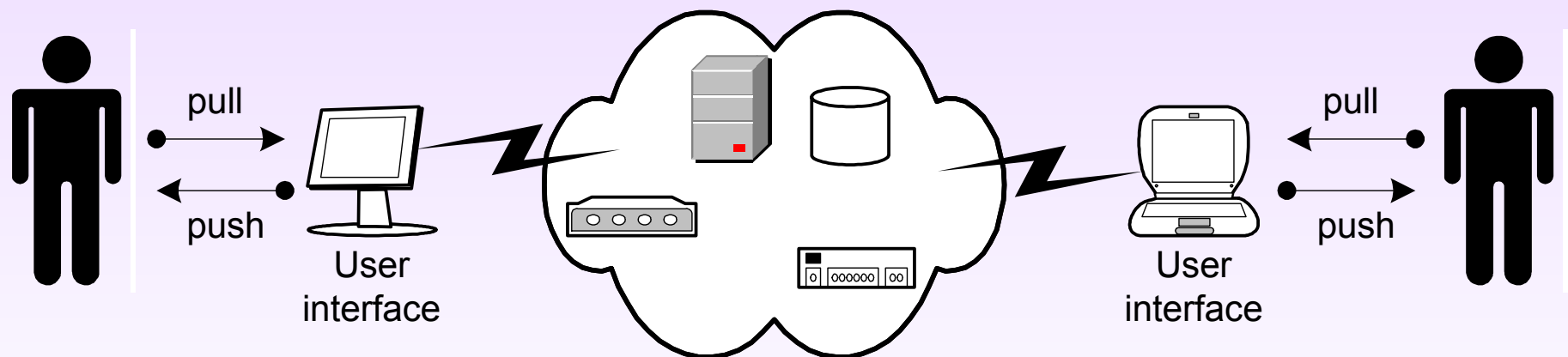
‘push’ model  
*Passive user*  
(*information reception*)



- phone call
- hearing an airport call for boarding
- warning window on a screen
- ...



## 2. Information exchange



‘push’ mode at layer (n) may be implemented  
on ‘pull’ mode at layer (n-1)

Demand for explicit mention of the layer concerned





## 3. Information management

Critical issue

- strong dependency among the companies engaged in a project
- high contribution of suppliers, management and coordination issues
- inefficiency due to inadequate transmission of information
- ...

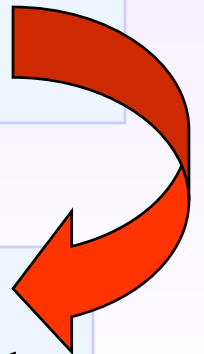


## 3. Information management

Information overload

- major problem for the managers in general
- major problem for construction professionals

- users are given more information than they can absorb
- when the information processing time exceeds the time available





## 3. Information management

Information retrieval

- information structuring
- information storage
- ease of access to information



## 3. Information management

Information asymmetry

Persons dealing with a given problem have different levels of information about the same object

**What?**

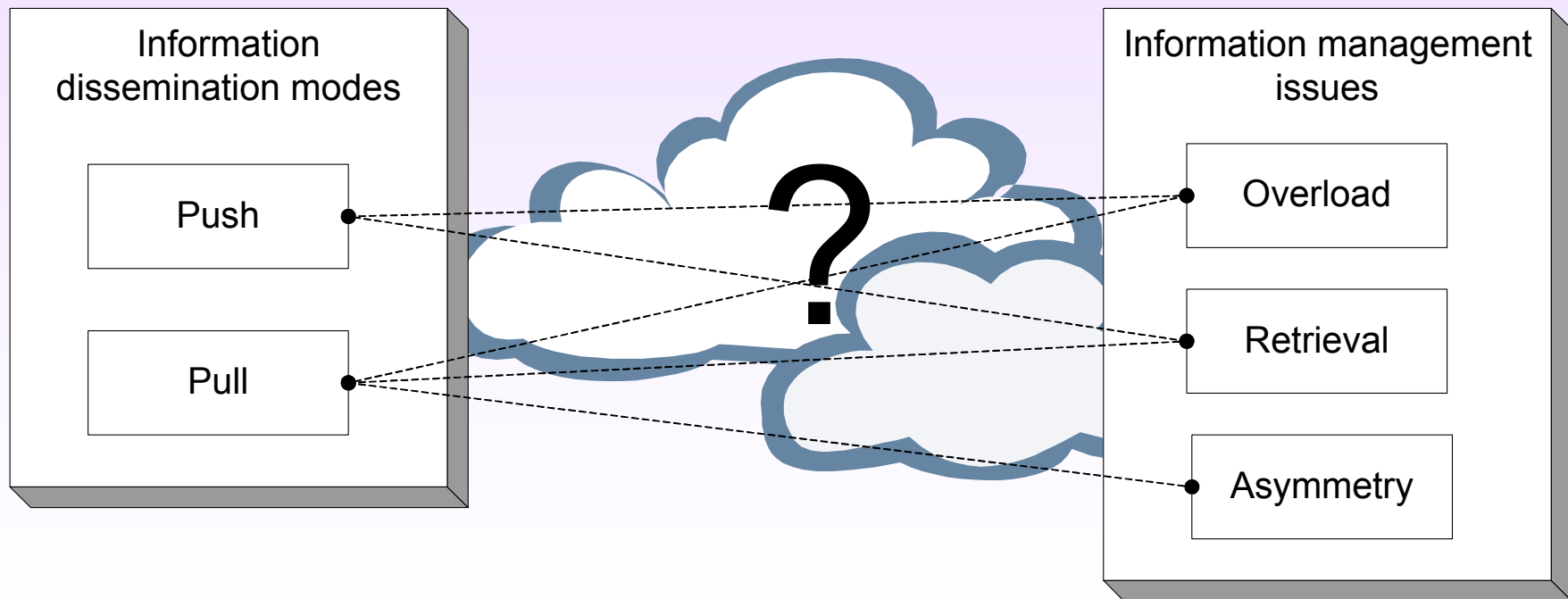
- distortion (loss of information integrity)
- incompleteness (loss of information pieces)

**Why?**

- deficient synchronization within the group
- imperfect transmission path



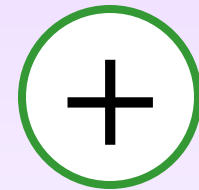
## 4. Relations





## 4. Relations

Push mode

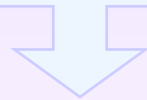


- sender demands the receiver to react to the incoming information
- information flows that require a rapid answer
- handle events having unexpected components
- reminding messages
- inform the user that some elements of the context have changed
- ...

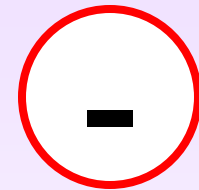


## 4. Relations

Push mode



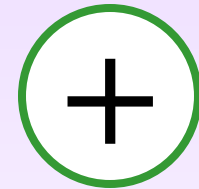
- information overload issue  
*may exceed cognitive capacity of the receiver*
- information asymmetry  
*transmission delay – content modification*





## 4. Relations

Pull mode



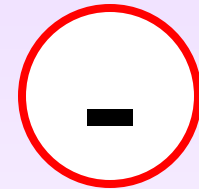
- limits the information overload
  - no disturbing incoming flows*
  - suppress the problem of 'just-in-case-they-need-it' push publishing*
  - no easy way for the user to abusively trigger hundreds of flows*
- information symmetry
  - one source hypothesized to be up-to-date*





## 4. Relations

Pull mode

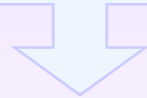


- dependence to the initiative taken by the user  
*what if the user doesn't instantiate any connection?*
- information retrieval issue  
*difficulty to find rapidly the required information*  
*discouragement to store anything in the repository*



## 5. Situation in AEC industry

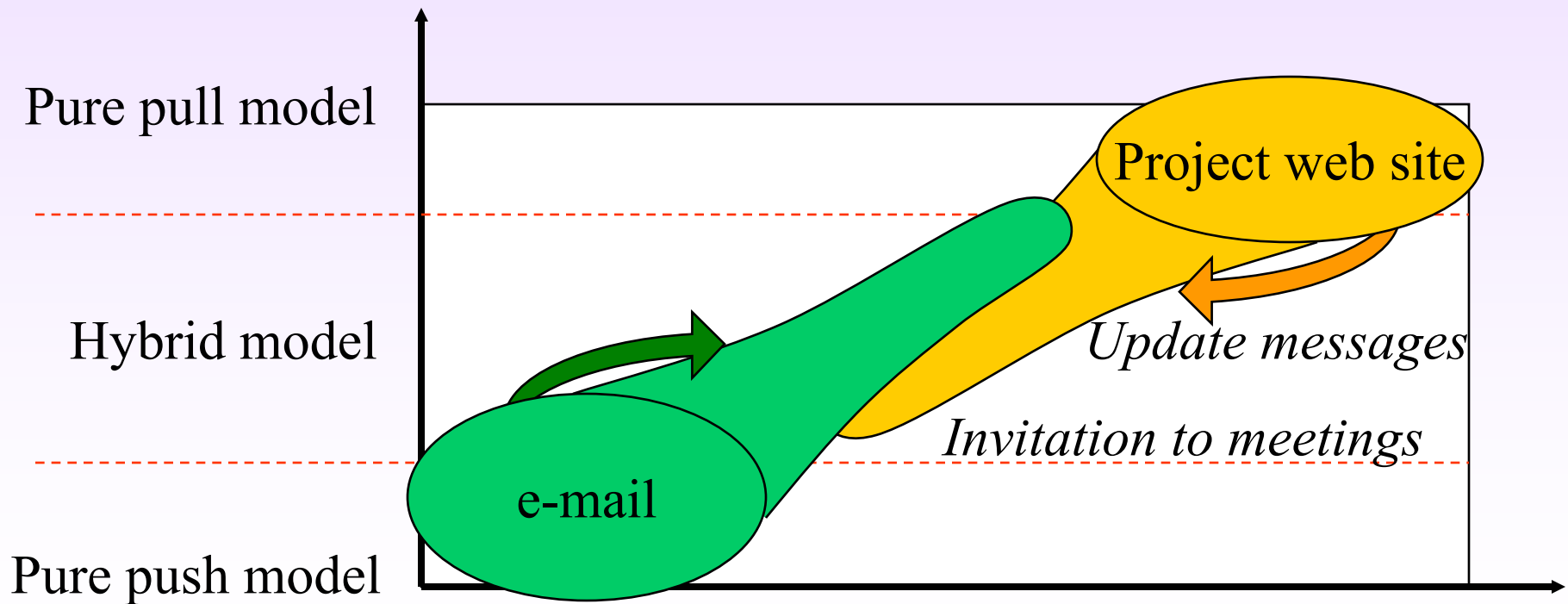
Combination of pull and  
push modes



- project specific web site (pull mode)  
*data update notification via e-mail (push mode)*
- e-mail to invite the receiver to visit a web site (push mode)  
*visit of the web site (pull mode)*



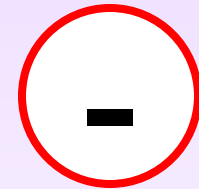
## 6. BBeLink2 prototype





## 5. Situation in AEC industry

Web sites



- information retrieval if large amount of data
- data partitioning / access rights management
- dependence on the company hosting the web site
- dependence on the usage by all project participants
- confidentiality of the data
- risk of failure of the web site operator
- change the mentality of the construction professionals



## 6. BBeLink2 prototype

Enhanced push mode

- no web site
- similar to classic e-mail (from the user viewpoint)
- handles point-to-point communications
- includes multicasting diffusion of information



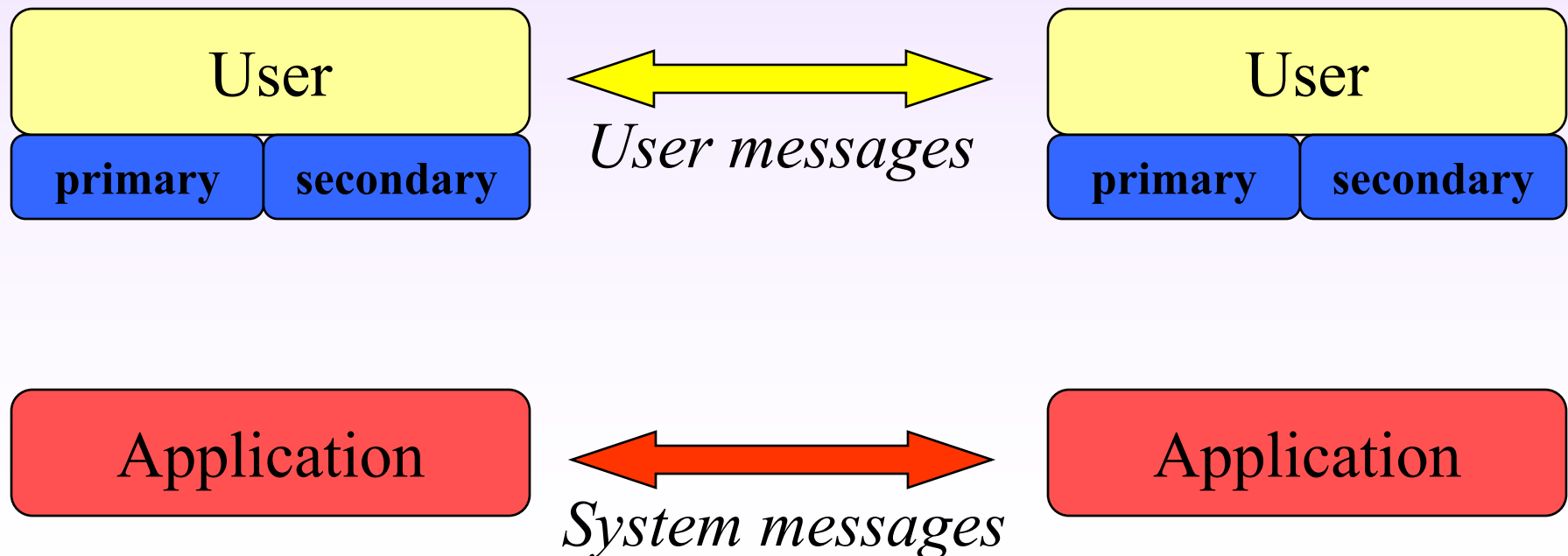
### 6. BBeLink2 prototype

- Client-Server architecture
- Java 2 technology (client and server)
- Tested on Windows NT/2000, MacOS X, Solaris SPARC
- XML technology
- Secured (RSA, Triple-DES, X.509 Certificates)
- Not based on classic SMTP e-mail
  
- Communication modules and storage modules



## 6. BBeLink2 prototype

Communication modules : 2 levels of messages





## 6. BBeLink2 prototype

The screenshot shows a 'New Message' window with the following fields and annotations:

- Project:** School of Echternach (Annotated with 'Project')
- To:** post
- Category:** Technical (Annotated with 'Category')
- Stage:** Pre-construction (Annotated with 'Project Stage')
- Priority:** High
- Opinion:** Positive
- Suddenness:** Expected
- Subject:** Former electric configuration (Annotated with 'Expiration date')

The 'Request' dropdown menu is open, showing options: Pre-project, Pre-construction, Construction, and Post-completion.

The 'Receiver Status' window is open, showing a table with the following data:

Receivers	Received on
post	8/23/02 5:07 PM CEST

The 'Secondary data' label points to the 'Receiver Status' window.





## 6. BBeLink2 prototype

### Enhanced 'Push' mode

- Reliable date assignment (SNTP)
- Digital signature: signed meta-data
- Encryption: high granularity
- Reliable acknowledgment mechanism





## 6. BBeLink2 prototype

Storage modules : 2 kinds of objects

**structured part**

**unstructured part**

**Communication instances**



## 6. BBeLink2 prototype

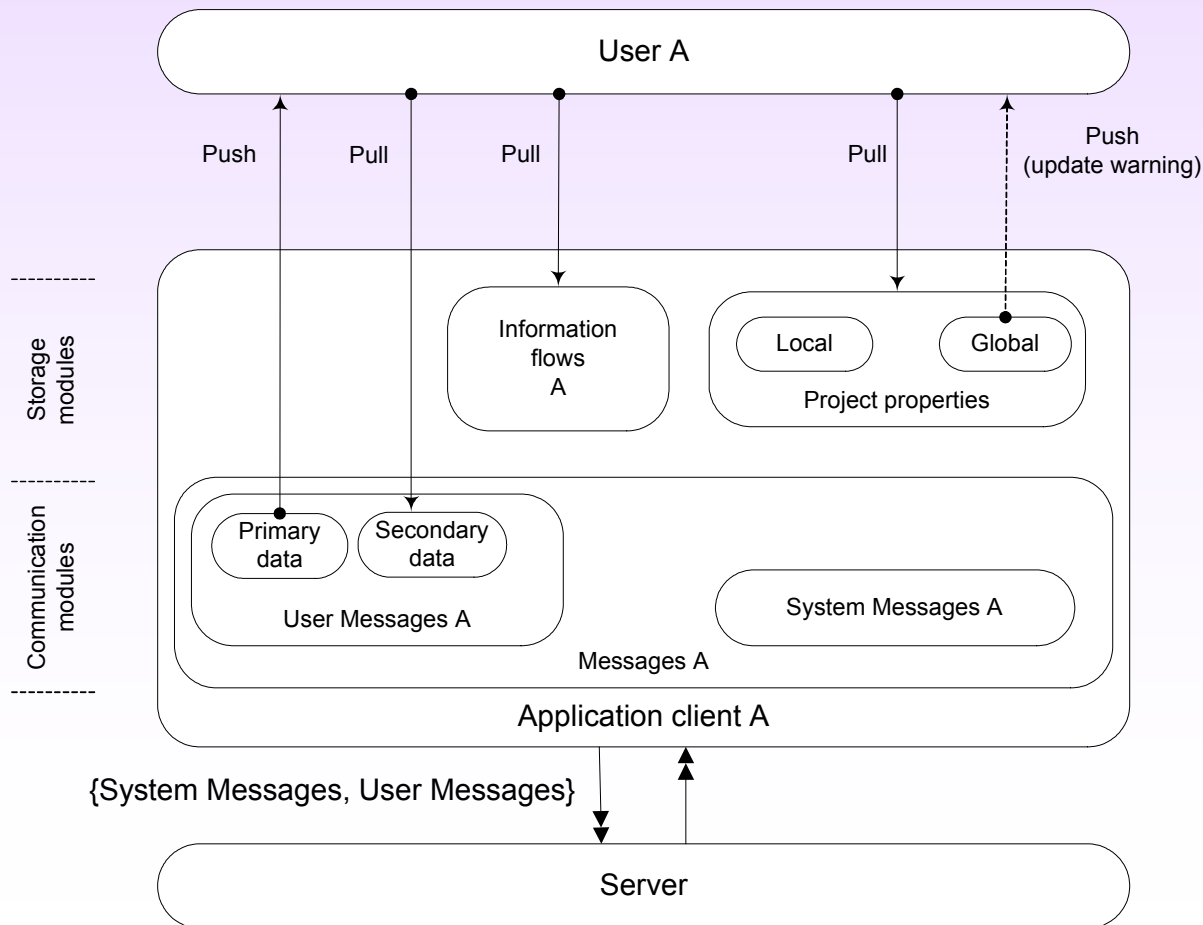
Storage modules : 2 kinds of objects

The screenshot displays a software interface with a tabbed menu at the top: General, Participants, Building, and Photo. The 'Photo' tab is active, showing a photograph of a large, multi-story building with a central entrance and a courtyard. To the right of the photo is a 'Project properties' window, which is highlighted with a red border. This window has its own tabbed menu (General, Participants, Building, Photo) and contains the following fields:

- Creator: otjacques
- Updated on: 8/26/02 3:08 PM CEST
- Full Name: Primary School of Echternach
- Place: Echternach, Luxembourg
- Type: Restoration (dropdown menu)
- Client Type: Public client (dropdown menu)
- Key Dates section:
  - Start Date: 8/1/02 12:00 AM CEST
  - Receipt Date: (empty)
  - Last Invoice: (empty)



## 6. BBeLink2 prototype





### 7. Solutions proposed by BBeLink2

Information overload

- messages limited to a defined community (no anonymous users)
- filtering mechanism of the client side
- distinction between primary and secondary data
- modularity to display the primary data
- generation of summary reports on all information flows
- low learning effort to use info.flows and message interfaces



### 7. Solutions proposed by BBeLink2

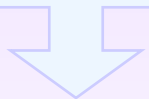
#### Information retrieval

- whole environment organized by project
- every message / info. flow explicitly linked to a project
- every message / info. flow with similar set of meta-data
- filtering mechanism may be used to organize incoming messages



## 7. Solutions proposed by BBeLink2

Information asymmetry



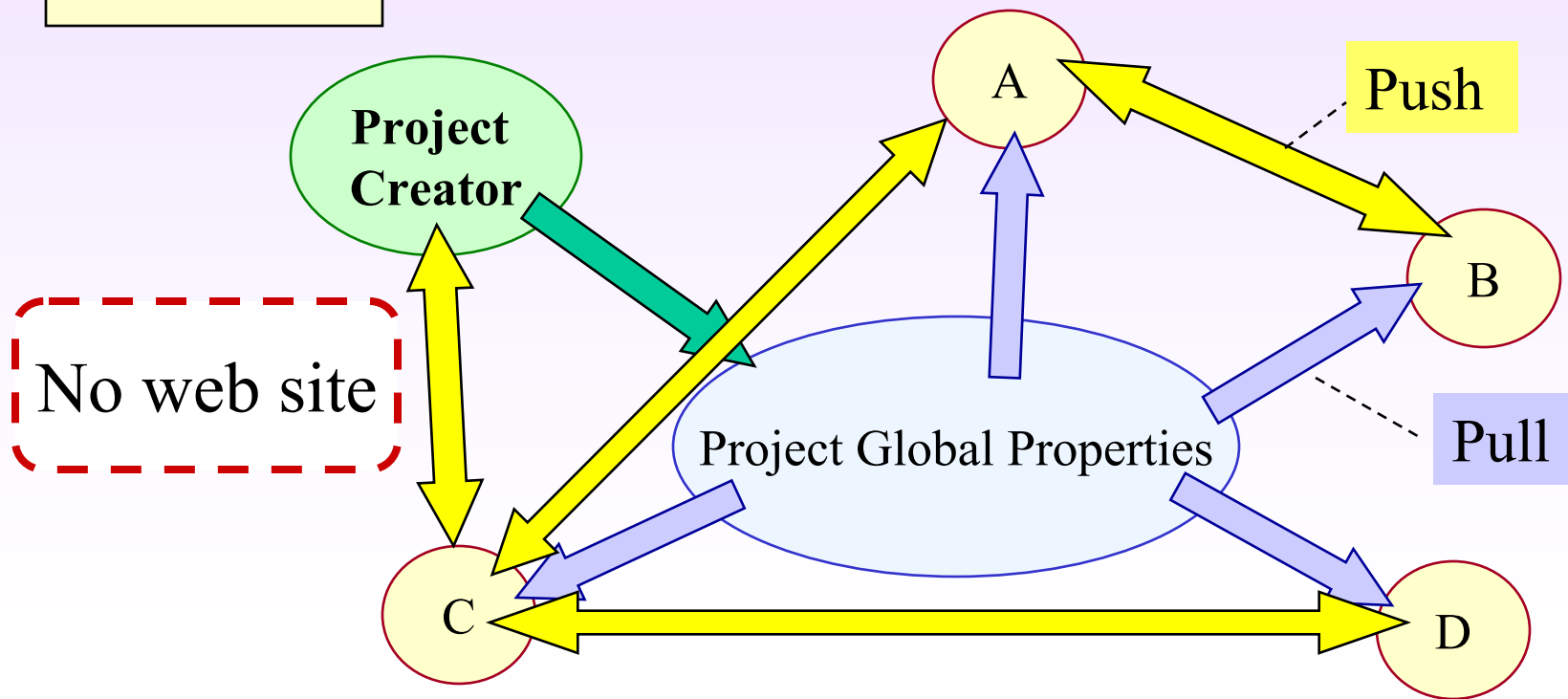
- synchronisation of data via multicasting
- local replication stored in an encrypted way
- synchronisation with the frequency rate of the Internet connection
- reliable dating system (external time server)
- acknowledgment with date for every message
- digital signature



## 7. Solutions proposed by BBeLink2

Participation

Hybrid mode 'Push/Pull'







## 8. Conclusions

- pull and push modes are complementary, not rivals
- pull and push may rely on different technologies

Study of functionalities must precede  
the technological reflections





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