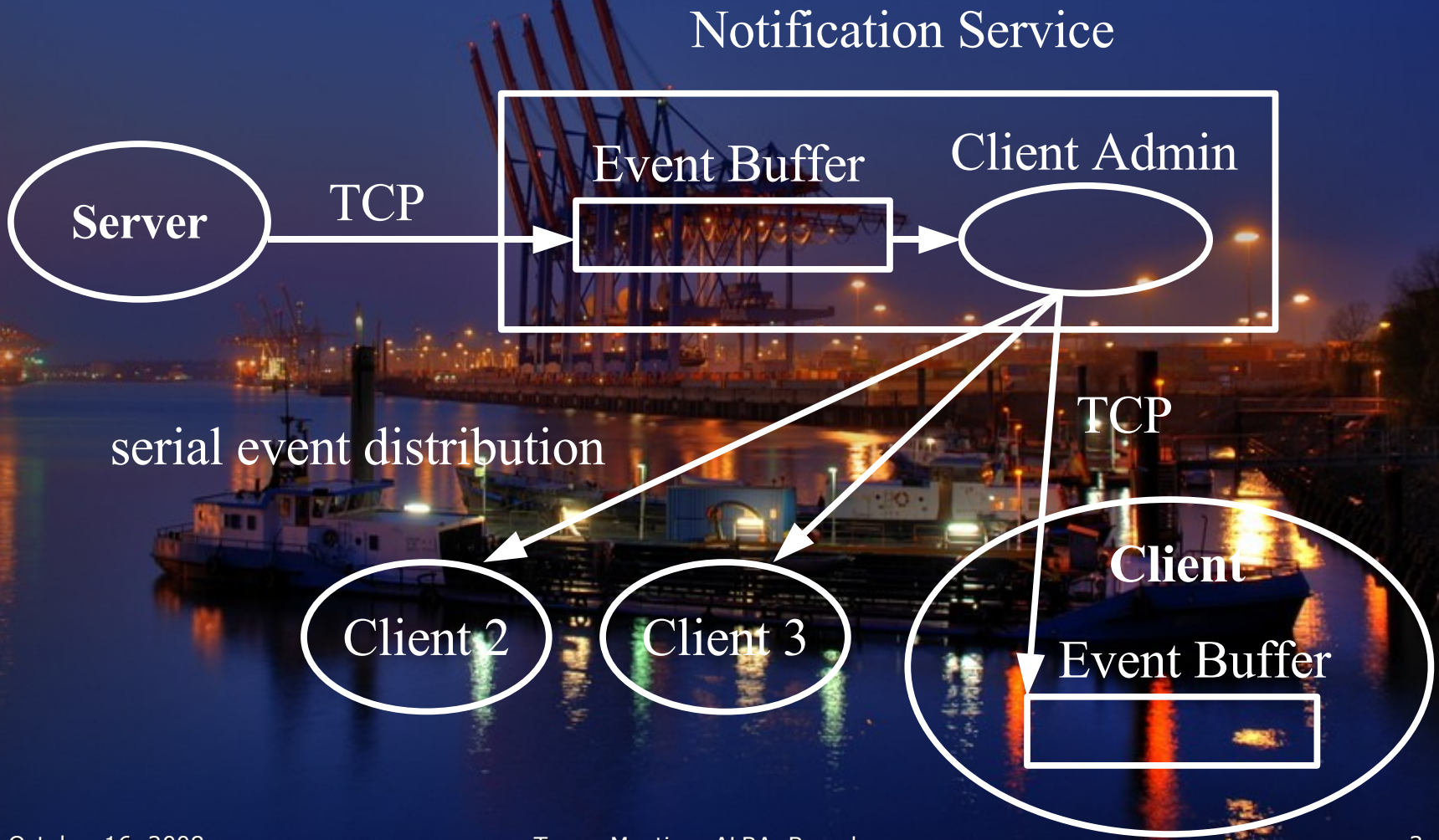
Multicasting and Data Streams for Tango?

- Outline
  - Why do we need multicasting?
  - What is available today?
  - Multi casting for Tango events
  - Discussion
  - Data Streaming
  - Discussion

Why Multicasting

- The Tango event distribution is limited when sending big amounts of data to several clients
  - CCD detector images 2000x2000 pixels
  - Video frames for a live display

What is available today?



What is available today?

- Decoupled event distribution
  - Will never block the device server
  - Event buffers to smoothen temporary high event rates
  - Client administration is not in the device server
- Notification Service (omninotify):
  - Event buffers are sizable : 1 to ∞
    - Default size = ∞
  - Event priority available, but not used
  - Event reliability : best effort, persistent mode is not implemented

What is available today?

- Event buffers on the client side to guarantee event reception without blocking the client
  - Round robin event buffers are sizable : 1 to ∞
  - No event priority
- Reliability and QoS
  - event transfer via TCP
  - Client re-subscription
  - heartbeat

Event Multicasting

Event Multicasting

- CORBA UMIOP : Unreliable Multicast Inter-ORB Protocol
  - Only implemented in some ORBs (TAO, ORBIX)
  - Not available with omniORB
  - TAO offers a Notification Service to multicast events

Event Multicasting

- Several implementations of multicast libraries are available
  - They do not fit with the CORBA framework used by Tango
  - Platform availability and multi language support is an issue
  - We want to have a **reliable** multi cast protocol

Event Multicasting

- OMG Data Distribution Service with RTPS (Real Time Publish-Subscribe) protocol
  - Data centric Publish/subscribe service based on multi cast
  - CORBA compatible IDL data definition
  - Real time QoS
    - retransmission, acknowledge, heartbeat, ...
  - Open source : OpenDDS based on TAO and JacORB
  - Several licensed implementations

Event Multicasting

- Major questions:
  - Can we use the CORBA UMIOP protocol?
    - Can we change our ORB?
    - Could we only use a multicast aware notification service?
      - Data need to be send twice!
    - We want to have a **reliable** protocol to ensure the QoS

Event Multi Casting

- Major questions:
  - Can we use the OMG DDS
    - Needs RTPS on the wire to be inter operable
    - RTPS implements the most complex part
    - Free OpenDDS based on TAO + JacORB
      - CORBA based, no RTPS protocol
      - Can we change the C++ ORB?
    - Licensed DDS implementation
      - RTI-DDS and OpenSplice implement RTPS
      - Do we want to use licensed software?
    - ORTE : free RTPS -> no multicasting

Event Multicasting

- Major questions:
  - Can we use another multicast library?
    - Few implementations for a reliable protocol
    - Implementations are language bound
      - Ex: Java Reliable Multicast Library
      - Ex: RML in C
    - Multi platform and multi language compatibility is needed
    - We have to support two different data description formats
      - Data copying is a performance issue

Event Multicasting

- Where to go?
  - The OMG DDS based on RTPS seems to be the product we need.
  - Compatible with CORBA due to the same IDL data description
    - Multi language bindings are possible
  - The QoS is part of the specification
    - Heartbeat, Re-subscription and buffering
  - Producer and subscriber administration is part of the specification

Event Multicasting

- Where to go?
  - But, only OpenDDS and JacORB are open source
    - We have to separate Tango in two layers
    - We have to change from omniORB to TAO
    - Would destabilize Tango
    - Wait for the results of the evaluation for ACS (ESO)

Event Multicasting

- Can we afford to implement our own DDS?
  - We could implement the parts we need following the OMG specifications
  - We need RTPS and not DDS. Only a multicast transport is needed
  - We need only a small part of the RTPS specification
  - Do we have the manpower or the money to implement a wire protocol?

Event Multicasting

- Where to go?
  - Home made solution:
    - Use, extend and port an available library
    - Specify the QoS parameters to implement
    - Reuse re-subscription, heartbeat and buffers
    - Encapsulate CORBA data on the wire
    - Needs testing of different implementations
    - Support of different data description formats
    - Data copying is a performance issue

Event Multicasting

- Where to go?
  - If the multicast event service works, it could be used as basis for the whole Tango event distribution
    - Give-up the notification service

Discussion

Please, express your opinion now or send your remarks to tango@esrf.fr

Data Streaming

- Which problems we want to solve when talking about streaming?
  - Multi media streaming?
  - Client feedback for the transfer rate?
    - Too much data, the server should slow down?
  - Error tolerant data transfer?
  - Data transfer on variable bandwidth networks?

Data Streaming

- Multi media streams
  - Stream data as a tango attribute of type **DevEncoded**
    - optimized bulk data transfer
    - Audio or video data can easily be transferred
    - The necessary **codecs** must be used to encode and decode the data
    - A Tango Multi Media Streaming Class might contain a set of available codecs

Data Streaming

- Multi media streams
  - Today:
    - Use the notification service to flow data to the clients by sending events
    - The event buffers on the client side will cache the incoming data
    - Two network hops will not allow to stream big chunks of data at a high rate
  - Tomorrow:
    - We might have a fast multicast event service to stream big data chunks in parallel to clients

Data Streaming

- Client feedback for the data transfer rate
  - A Tango device server should not be influenced by a single client!
  - Only the device server programmer can implement an appropriate action
  - The event buffers of the notification service and the client can handle a **temporary** high event rate

Data Streaming

- Error tolerant data transfer and data transfer on variable bandwidth networks
  - When using DDS these issues would be addressed by the underlying RTPS protocol
  - Otherwise do we need this? Tango is a control system and not an Internet service


Discussion
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