Multicast deployment and QoS measurement in ICEBERGS

Cost272 meeting

University of Surrey, 5-6 Dec 2002
Presentation contents

- Project overview and status
- Multicast design and deployment
- ICEBERGS demonstrator and QoS measurements
- Conclusion
ICEBERGS

- ICEBERGS: IP ConferEncing with Broadband multimedia over Geostationary Satellites

- The target of ICEBERGS is the successful integration of satellite system into the Global Information Infrastructure to provide IP multiparty videoconference services (multicast real-time) over next generation geostationary, Ka-band, broadband satellites (EuroSkyWay)

- Project start date: 1st November 2001

- Duration: 18 months

- The consortium is composed of five partners from industry and academia located in Italy, UK and Spain
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<th>Participant Name</th>
<th>Role</th>
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<tr>
<td>Telefonica R&amp;D, TID</td>
<td>• Project Management</td>
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<td>• SIP based Multiconference Service Architecture Design, Development and Integration with fixed networks</td>
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<td>• ISP Perspective</td>
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<td>Alenia Spazio, ALS</td>
<td>• Satellite Network Architecture Design and Development</td>
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<td>• Multicast QoS Support Design and Validation</td>
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<td>• Overall Demonstrator Development and Trial Supervision</td>
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<td>University of Surrey, UniS</td>
<td>• System Requirements Definition</td>
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<td>• Network Security</td>
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<td>• Network Analysis</td>
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<td>Sistemas y Redes telematicas, SIRE</td>
<td>• IP Multicast Routing Design</td>
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<td>• Multimedia Applications optimised for Satellite Definition</td>
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<td>University of Valladolid, UOV</td>
<td>• Application QoS monitoring</td>
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Multiple MCU Conference Model

- **Multiple MCU (Multipoint Control Unit) model**
  - End users send and receive multimedia streams via unicast to the MCUs
  - MCUs collect and manipulate the streams, and generate multicast flows that will be received by the rest of MCUs
  - MCUs use multicast to communicate with each other

- **Multicast-enabled end users can:**
  - Send and receive media to a multicast group, similar to MCUs
  - Perform end audio/video mixing/switching
Multiple MCU Conference Model Example

Unicast User

Multicast flow (Audio activation)

MULTICAST Network Including ESW

Multicast User

Mixed in MCU

Unicast User

Mixed in MCU

Unicast User

Mixed in MCU

Unicast User

Mixed in MCU
## Review of multicast protocols: protocol stack

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Review of multicast protocols: Routing protocols

- Distance Vector Multicast Routing Protocol (DVMRP)
- Core Based Trees (CBT) protocol
- Multicast Extensions to OSPF (MOSPF)
- Protocol Independent Multicast (PIM) dense mode (PIM-DM)
- PIM-SM (sparse mode)
- Multiprotocol Border Gateway Protocol (MBGP)
- Multicast Source Discovery Protocol (MSDP)
Impact of ICEBERGS on Multicast

**Impact of Multiple MCUs conference model**
- Few multicast group members, the MCUs, in one AS
- All MCUs are sparsely distributed
- PIM-SM is recommended as the intra-domain multicast routing protocol

**Impact of Satellite network**
- Star topology with the satellite domain as centre
- All terrestrial network domains connect with satellite domain
- Deployment of RP: intra-domain administration
- Inter-domain multicast routing protocols are needed
  - Choice of MSDP/MBGP
  - Hierarchical Multicast
  - Satellite end users
Multicast hierarchical example of star topology

F-RP: Federated RP
S-RP: Satellite RP
ICEBERGS Multicast Framework

AS_n Network Domain

ISP_k Unicast Domain

ISP_k Multicast Domain

ISP_k Unicast-Multicast Domain boundary

ISP_k Multicast Domain

ISP_k Multicast EUs

WAN/NISP

INTERNET

ESW AS Network Domain

ESW EUs with EMR

ESW Payload

MSDP/MBGP

PIM-SM

BR: Border Router
MR: Multicast Router
UR: Unicast Router
ISP: Internet Service Provider
NSP: Network Service Provider
WAN: Wide Area Network
RP: Rendez-vous Point

EU: End User
NOC: Network Operation Centre
NCC: Network Control Centre
MCS: Master Control Station
PrT: Provider Terminal
SaT: Satellite Terminal
R: Receiver
ERP: ESW RP
EBR: ESW enabled Border Router
EMR: ESW enabled Multicast Router
ICEBERGS demonstrator scenarios

- The Demonstrator layout is based on two different scenarios:
  - SkyPlexNet, using HB5 and HB6 satellite, is used as satellite access
  - ESW network emulator is used to substitute the real satellite network

- In both scenarios, the terrestrial network entities are as follows:
  - Two Corporate/Business Sub-network with satellite terminal
  - One Federated ISP with the satellite terminal
  - Two terrestrial Federated ISP

- Multicast will be implemented in the satellite emulator scenario

- QoS parameters and measurement scenarios are to be defined
Associated with IP Performance Metrics working group in IETF, a set of parameters needs to be measured and calculated:

- One-way delay
- End-to-end delay
- One-way delay variation (jitter)
- End-to-end delay variation
- Round-trip delay
- One-way packet loss
- One-way packet loss rate
For each parameter, a metric has been defined to record all measured data.

These parameters will be studied in the demonstrator, to clarify the effect on different segments:

- Unicast end user to local MCU
- MCU to MCU
- Local MCU to end user
- End-user-to-end-user
Measurement scenario for ICEBERGS
Conclusions

- Overview and analysis of conferencing and multicasting architectures over GEO satellites
- Multiple MCU conference model proposed for ICBERGS
- Unicast and multicast hybrid system architecture studied and developed
- Study and design of multicast over satellite
  - PIM-SM / MSDP / MBGP architecture
- **ICEBERGS demonstrator is being developed to implement and test all techniques developed in the project**
  - With real satellite access
  - With ESW emulator
- QoS measurement defined for ICEBERGS