SAMTK: A Toolkit for Scalable Adaptive Multicast

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Background

- Multi-point communication is one of the important objective of network usage.
- However, real-time SAM communication is not yet widely utilized.
- IP-Multicast is still not widely deployed.
- There are a lot of SAM related researches and technologies.
  - ALM, OM , Yoid, ESM, ...
  - But they are not used in real world..

Motivation

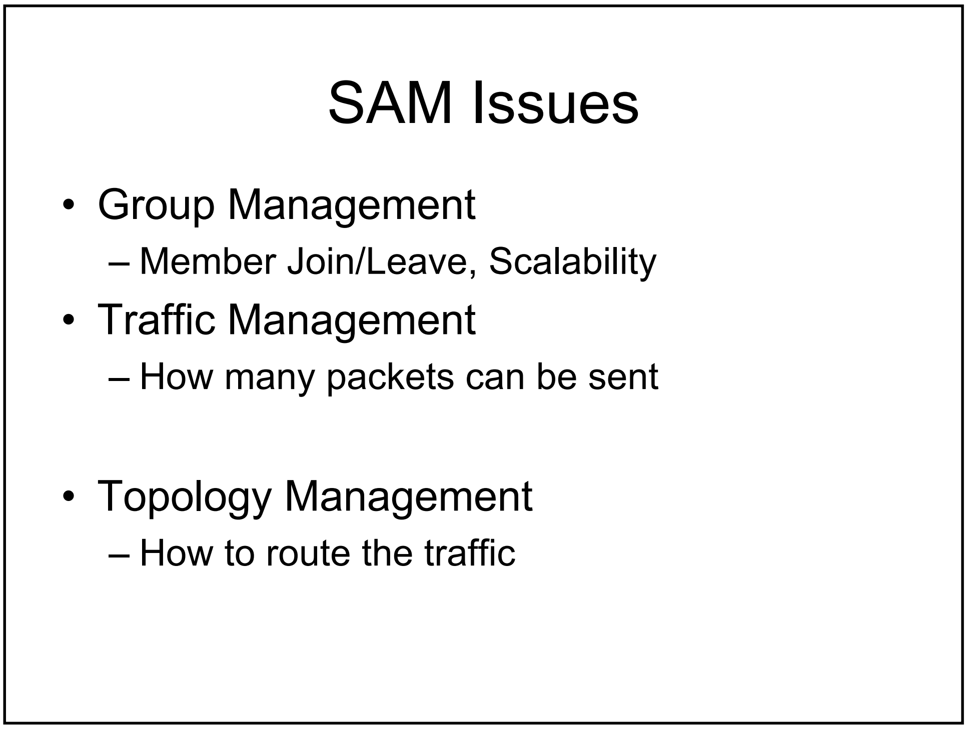
Fill a gap between researchers
and ↕
real-world applications.

- It's hard to implement a whole real world multi-party application for SAM researchers to show feasibility.
- Application developers do not consider to develop their own application to adapt other SAM protocols.
  - vic, rat, ... Skype.

SAMTK : a Toolkit for SAM

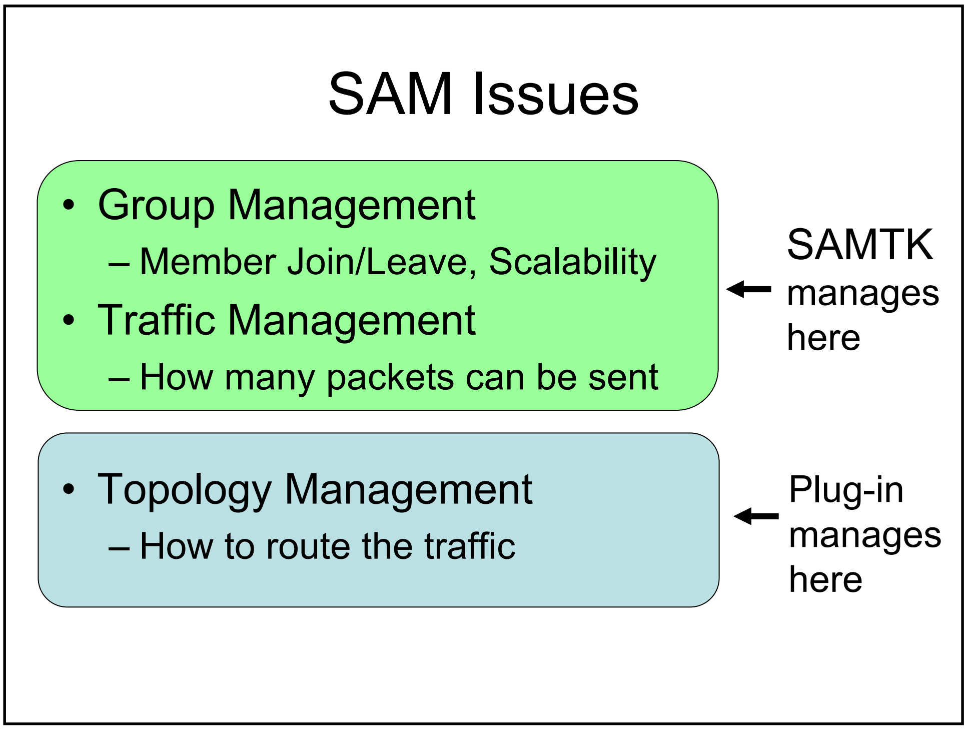
- Platform for both SAM researchers and application developers.
- Common API for SAM communication protocols.
  - Group management.
  - Multi-layered communication.
- Ease of application development.
- C++ , Qt, Multi-platform(Win /Mac /Linux/BSD)

Currently ongoing development
under Japanese Governmental Budget (2007/09).



SAM Issues

- Group Management
  - Member Join/Leave, Scalability
- Traffic Management
  - How many packets can be sent
- Topology Management
  - How to route the traffic



SAM Issues

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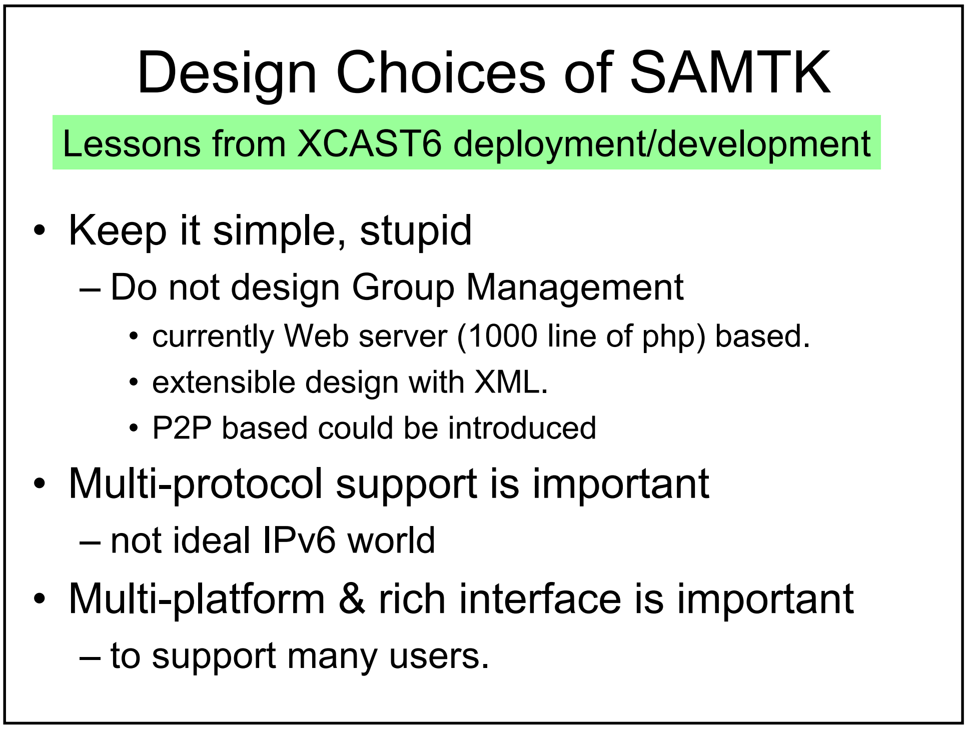
← SAMTK manages here

- Topology Management
  - How to route the traffic

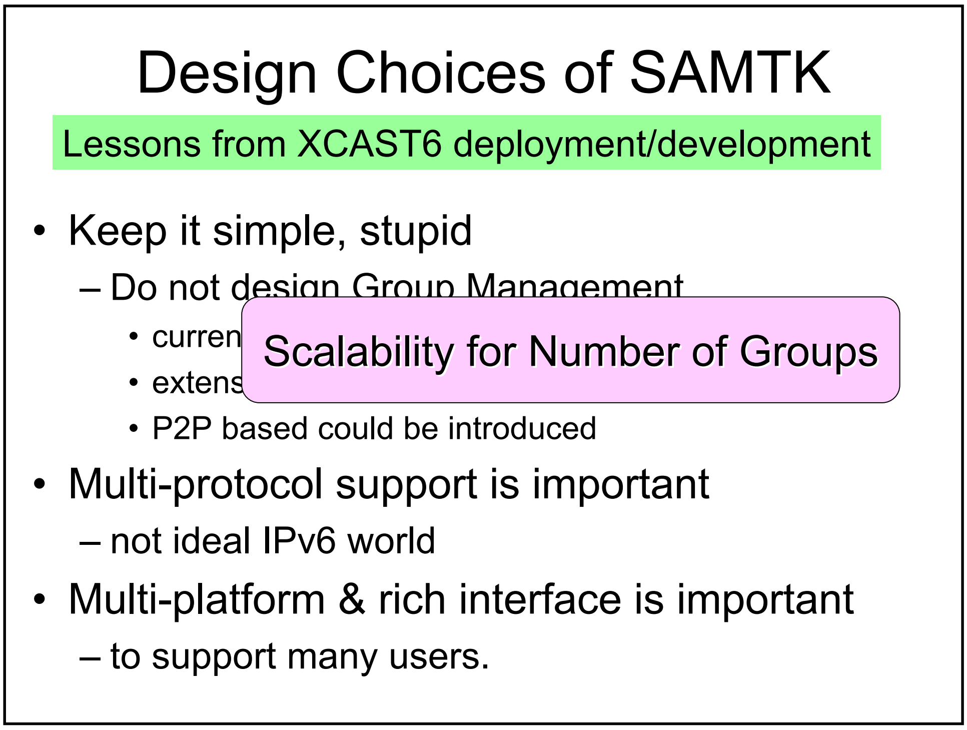
← Plug-in manages here



Design Choices of SAMTK

Lessons from XCAST6 deployment/development

- Keep it simple, stupid
  - Do not design Group Management
    - currently Web server (1000 line of php) based.
    - extensible design with XML.
    - P2P based could be introduced
- Multi-protocol support is important
  - not ideal IPv6 world
- Multi-platform & rich interface is important
  - to support many users.



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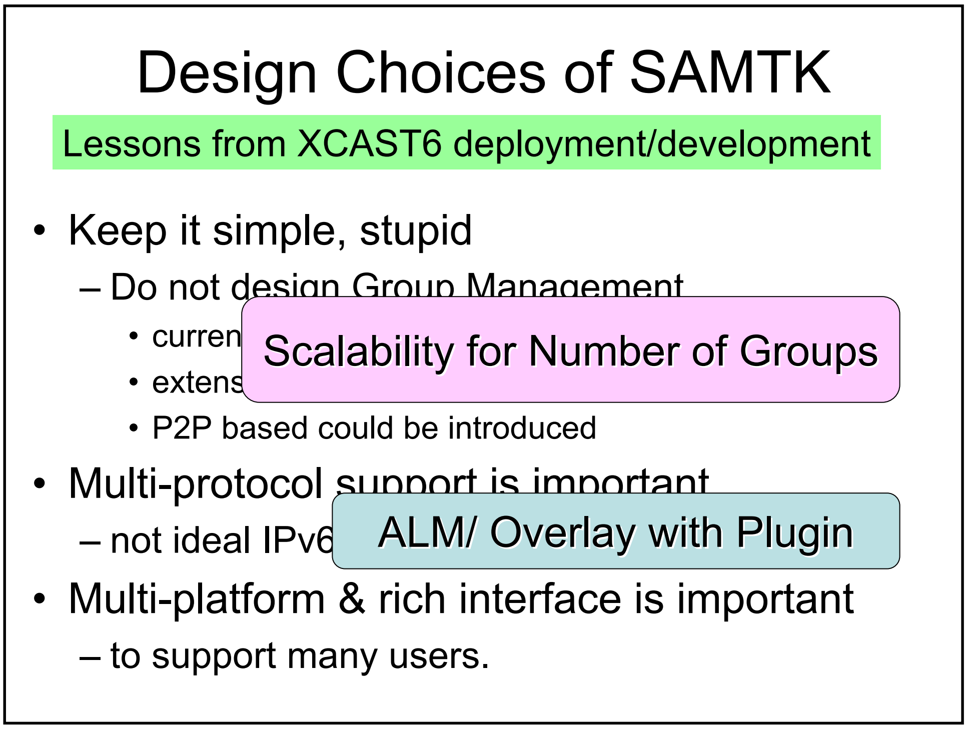
Scalability for Number of Groups



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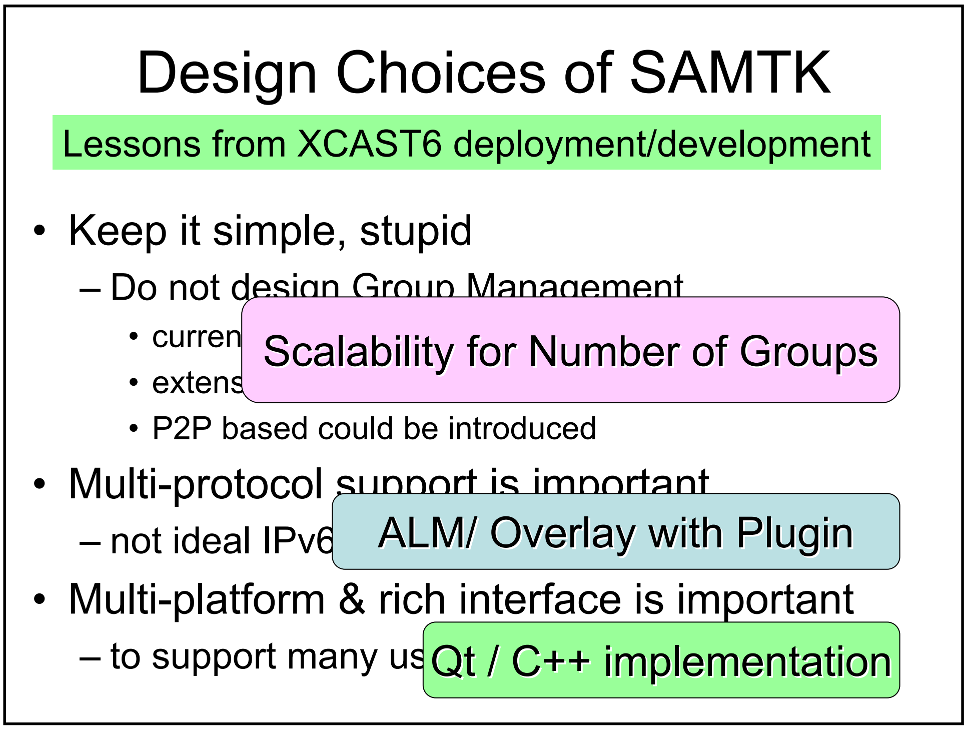
ALM/ Overlay with Plugin



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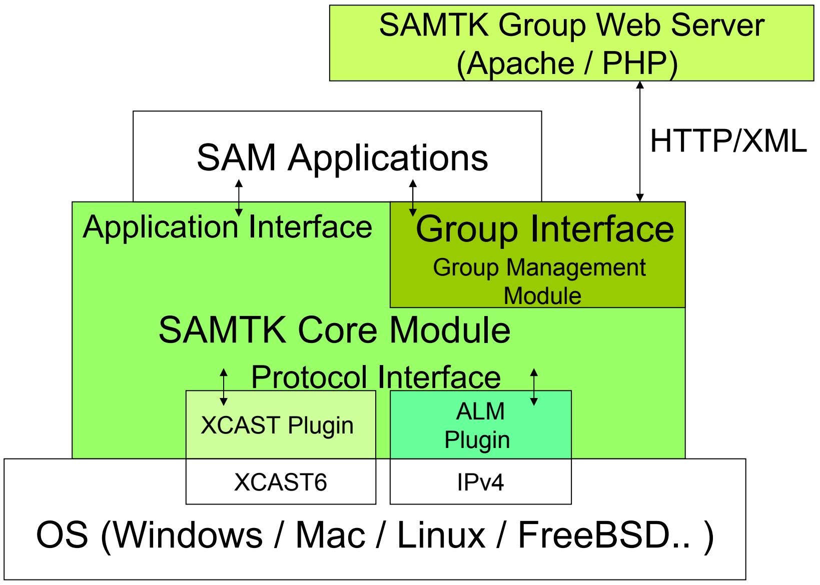
ALM/ Overlay with Plugin

Qt / C++ implementation

SAMTK Architecture



Application Interface

Interface from applications

- SAMSocket : Multipoint socket class
  - Separation of send socket and receive socket
  - Underlined protocol can be choose through plugin interface
- GroupAddress : Multipoint address class
  - Composed from member information
  - Currently identified through group URI

SAMSocket subclasses

- SAMSendSocket
  - UDP based interface
  - Socket for Multipoint send
- SAMReceiveSocket
  - Socket for Multipoint reception
    - management of several streams from different sources
  - Qt Slot/Signal based handling

Group Interface

- Several concepts of "Group" in SAM
  - Multicast group
  - Small group
  - Hybrid group... (Multicast - Unicast)
- We currently employ simple server-based group management.
  - will implement p2p group management.
- Every group/member is identified through GroupURI / MemberURI

Group Management Methods

- getSAMGroupMemberList(GroupURI)
- getSAMGroupMember(MemebrURI)
- getSAMGroupInfo(GroupURI)
- getSAMGroupAddress(GroupURI)
- addGroup(newGroupURI, path)
- deleteGroup(GroupURI)
- addMember(GroupURI)
- joinGroup(GroupURI, properties)
- deleteMember(MemberURI)
- setProperty(MemberURI, Key, Value)
- deleteProperty(MemberURI, Key, Value)

Protocol Interface

- Interface for protocol plugins
- Overlapping socket interface to Multi-Destination
- Multi-destination is passed by SAMGroupAddress

Protocol API

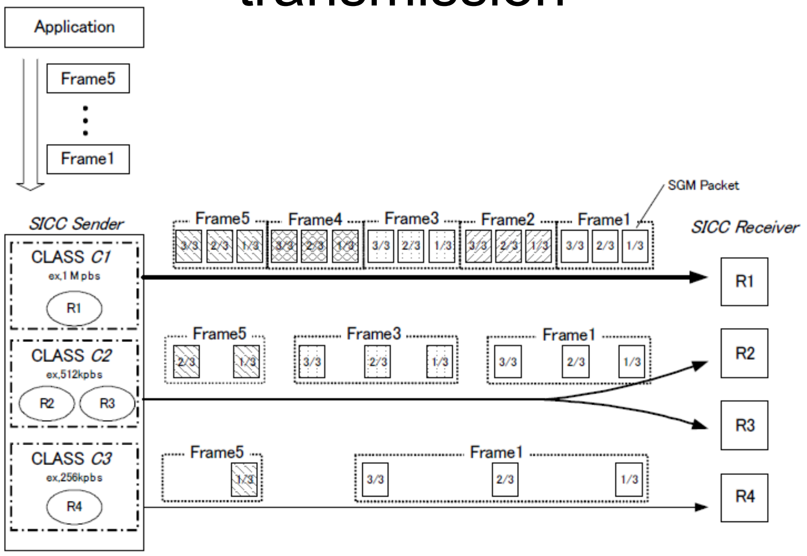
- setGroup(GroupAddress)
- writeDatagram(char * , int, GroupAddress)
- readDatagram(char *, int, HostAddress)

- bool hasPendingDatagrams()
- bind(port)

Multi-layered Communication

- Adaptation to the network.
- Participant node can choose their traffic class by itself.
  - Traffic class is shared by using Group Server
- Automatic adaptation is a research issue.
  - not implemented

Multi-layered packet transmission



DEMO

SAMDeskShare

- Mulitipoint Desktop sharing

SAMTrafficTester

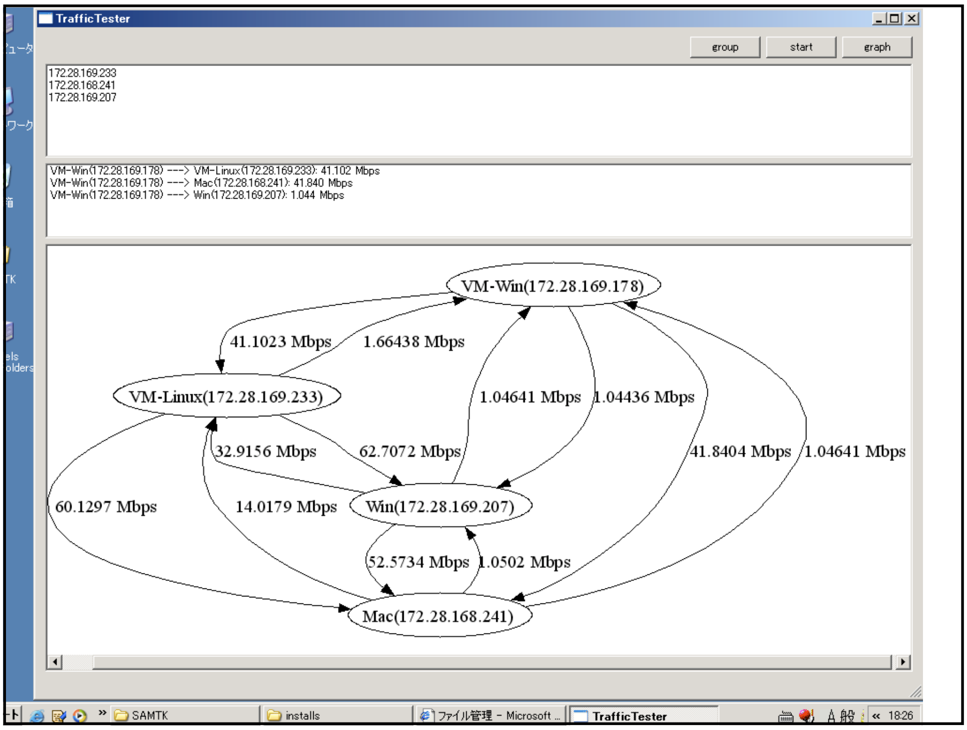
- Multipoint traffic measurement

SAMDeskShare

- Multipoint sharing of desktop and audio

SAMTrafficTester

- Multipoint UDP traffic tester
- Based on iperf UDP mode
- Mesh communication
  - all connection is checked
- Draw a graph of Topology & Speed
  - utilize graphviz



```
172.28.169.233
172.28.168.241
172.28.169.207
```

```
VM-Win(172.28.169.178) ---> VM-Linux(172.28.169.233): 41.102 Mbps
VM-Win(172.28.169.178) ---> Mac(172.28.168.241): 41.840 Mbps
VM-Win(172.28.169.178) ---> Win(172.28.169.207): 1.044 Mbps
```

Summary

- SAMTK enables quick test/deployment of a new multipoint communication protocols.
- Researchers take a benefit of real-world application based on SAMTK.
  - easy to compare with other protocols.
- Application developer take a benefit of multi-protocol implementation.

Comments!

- Please send comments to
  kawaguti @ nagoya-u.jp

- http://sourceforge.net/projects/samtk
- (currently not well documented)
- Documentation will come around Sep.

Discussions

- How we define "Application Interface" and "Protocol Interfaces"