

Centre for  
Telematics and  
Information  
Technology



University of Twente  
*The Netherlands*

# **Simple Interdomain Bandwidth Broker Signaling**

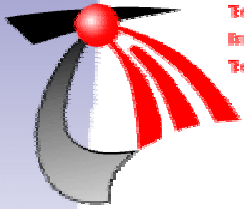
## *Toward an E2E Signaling Architecture for the QBone*

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(Supported by SURFnet b.v. Contract 3365)

**Ben Teitelbaum, Internet2**

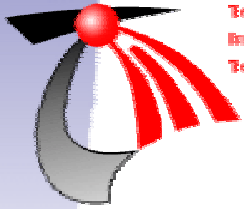
**...and a cast of many others**



## Background

### Product of the Bandwidth Broker Advisory Council (BBAC)

- **Led by Sue Hares (Merit Inc)**
- **Existed throughout most of 1999 as a virtual workgroup**
- **Traded documents and held frequent telephone conferences**
- **BBOP held in November 1999 to demonstrate the implementations of Phase 0 work**



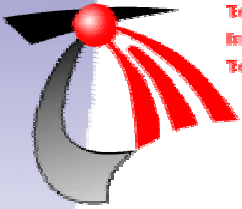
# Goals

## Goals of the Workgroup

- **Define BB model to be used in the QBone**
- **Recommend deployment phasing**
- **Specify common inter-domain protocol**

## Goals of the Design

- **Simple model**
- **Simple protocol**
- **Low entry cost**
- **Suitable for experimentation**
- **Extensible**
- **Leave as much flexibility as possible for research**



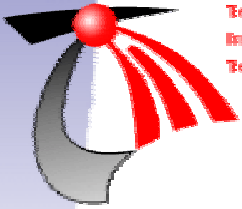
# Services

## Services

- **What must be specified ?**
  - **Fixed points (or intervals) in the space-time**
  - **What is the input from the customer side**
  - **What is provided from the service provider side**
- **Some of the elements may be “unspecified”**
- **Realizable with (concatenated) DS PHBs**

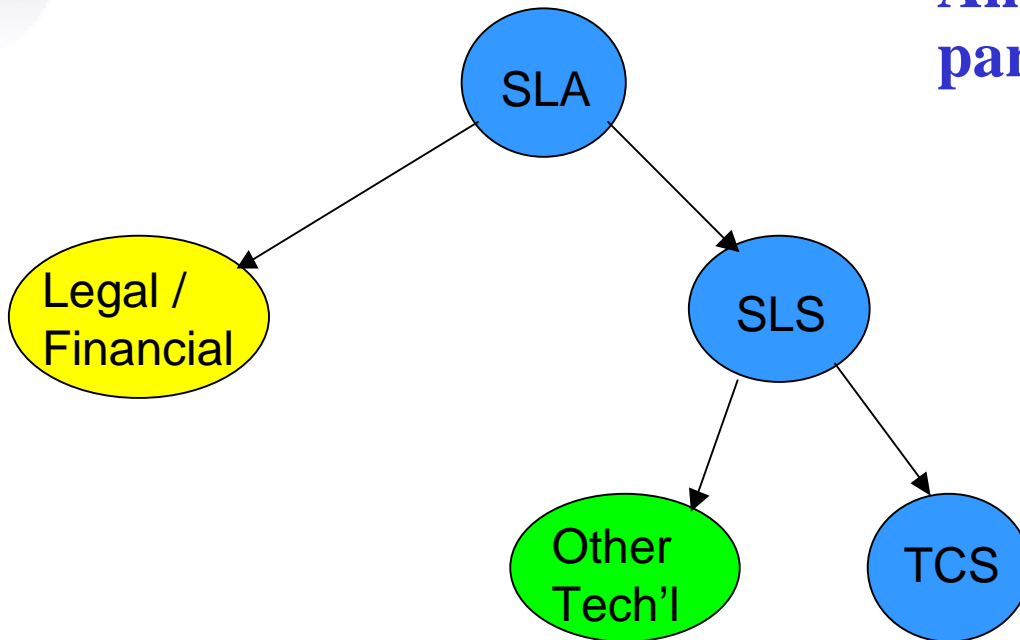
## Globally Well-Known Service

- **Agreed-upon service definition across domains**
- **Each domain is left to decide implementation**

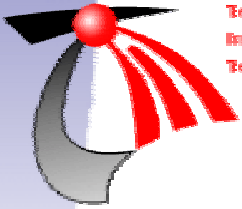


# SLAs and SLSs

An SLA consists of several parts:



- **Legal and financial specifications (not interesting here)**
- **Service Level Specification (technical)**
  - **Traffic conditioning specification**
  - **Other technical specifications (e.g. reliability/availability, service metrics, etc.)**



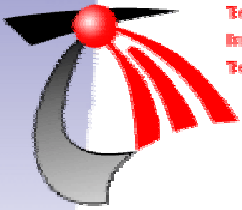
# Concept of Reservations

## SLS is like a stock option

- Potential for resource use
- Option must be exercised

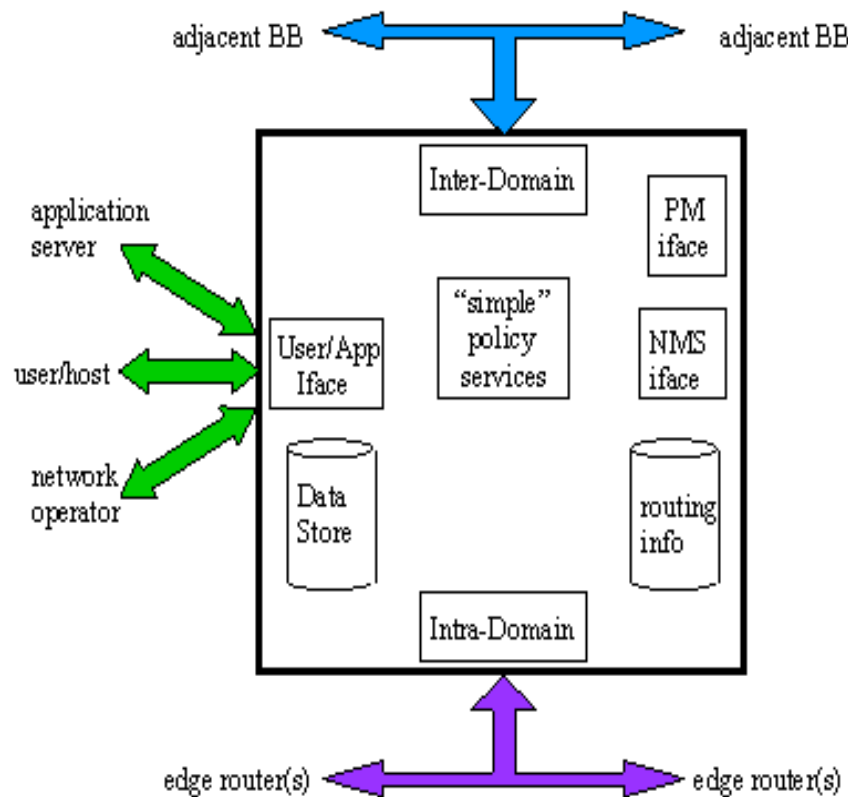
## Reservation exercises the option

- Is a claim on resources
- Depends on interlocking SLSs between domains
- Uses the “ripple through” of policy and allocation
- Protocols here are for reservation establishment, not SLS negotiation

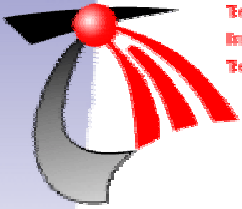


# BB Conceptual Model

## Major Blocks



- Intra-domain protocol
- Inter-domain protocol
- User interface
- Network Management Interface
- Routing interface
- Policy functions
- Local resource and configuration data



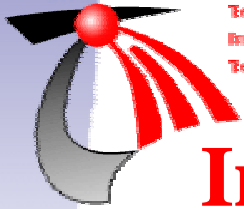
# Intra-domain Communication

## End systems (or agents) to bandwidth brokers

- **Web interface**
- **RSVP**
- **DIAMETER**
- **COPS**
- **RYO**

## Bandwidth brokers to routers

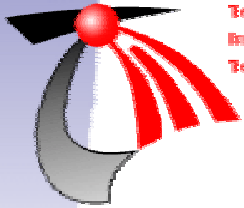
- **CLI**
- **SNMP**
- **COPS**



# Inter-domain Communication (SIBBS)

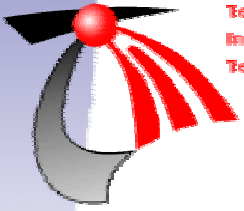
## Simple Inter-domain Bandwidth Broker Signalling

- **TCP is transport**
- **Fundamental messages:**
  - **Resource Allocation Request**
  - **Resource Allocation Answer**
- **Simple request-response protocol**
- **Requires some basic authentication**
- **Supports setup, modification, takedown**
- **Intended to be flexible and extensible**

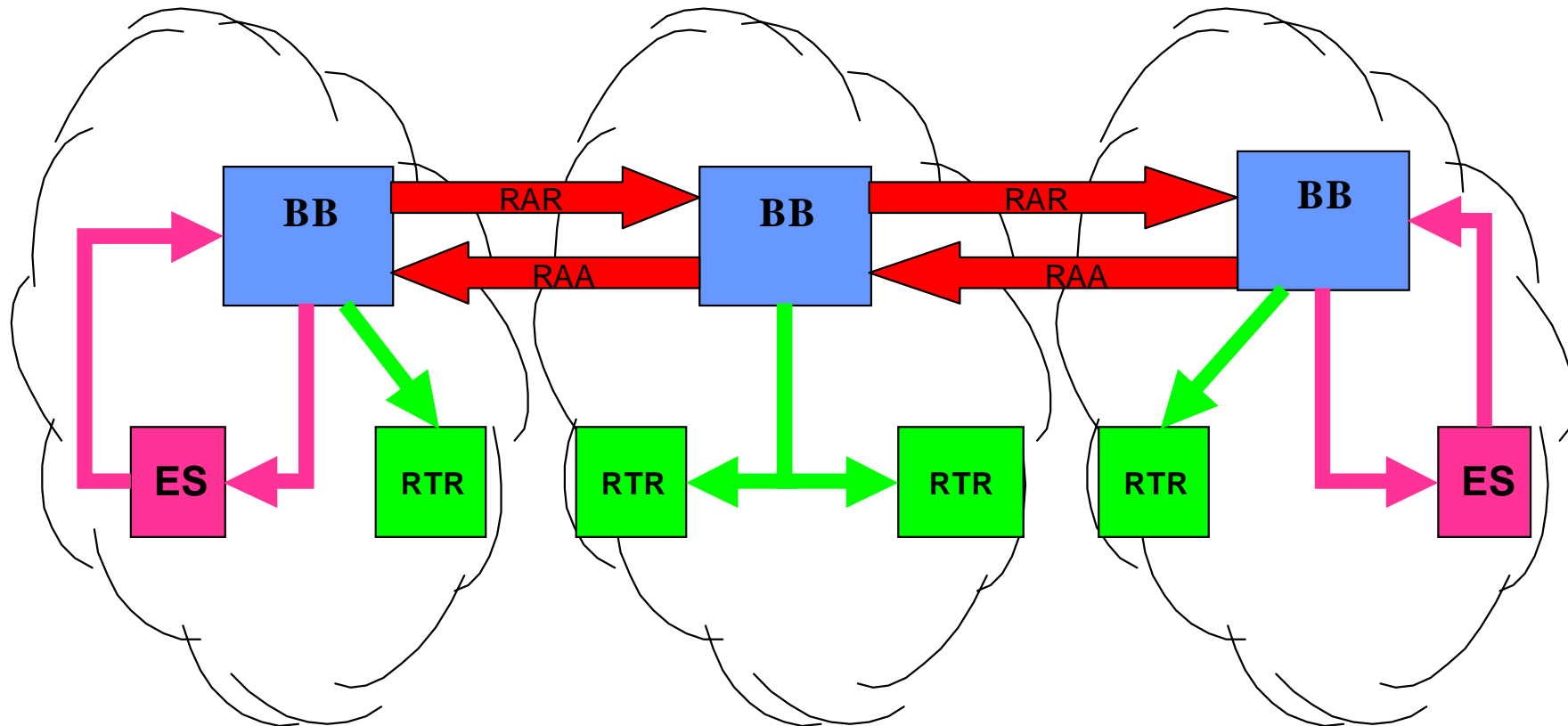


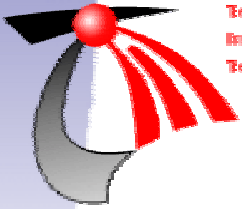
# DRAFT SIBBS RAR

SIBBS version	RAR ID
Sender ID	Sender Signature
Source Prefix	Destination Prefix
Ingress Router ID	Start Time
Stop Time	Flags
GWS ID	Service Parameter TLV
Other (Optional) TLVs	

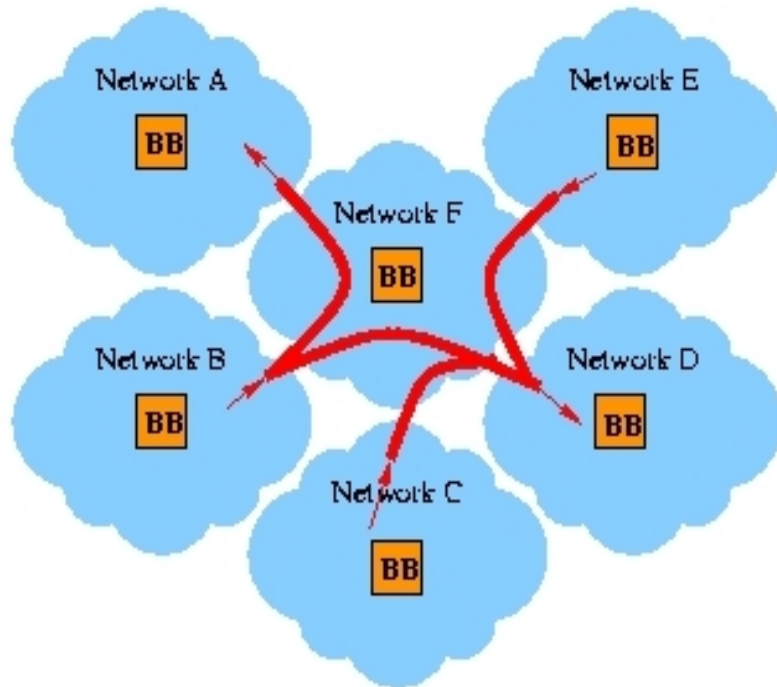


# Sample Setup

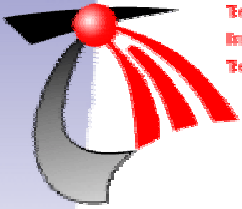




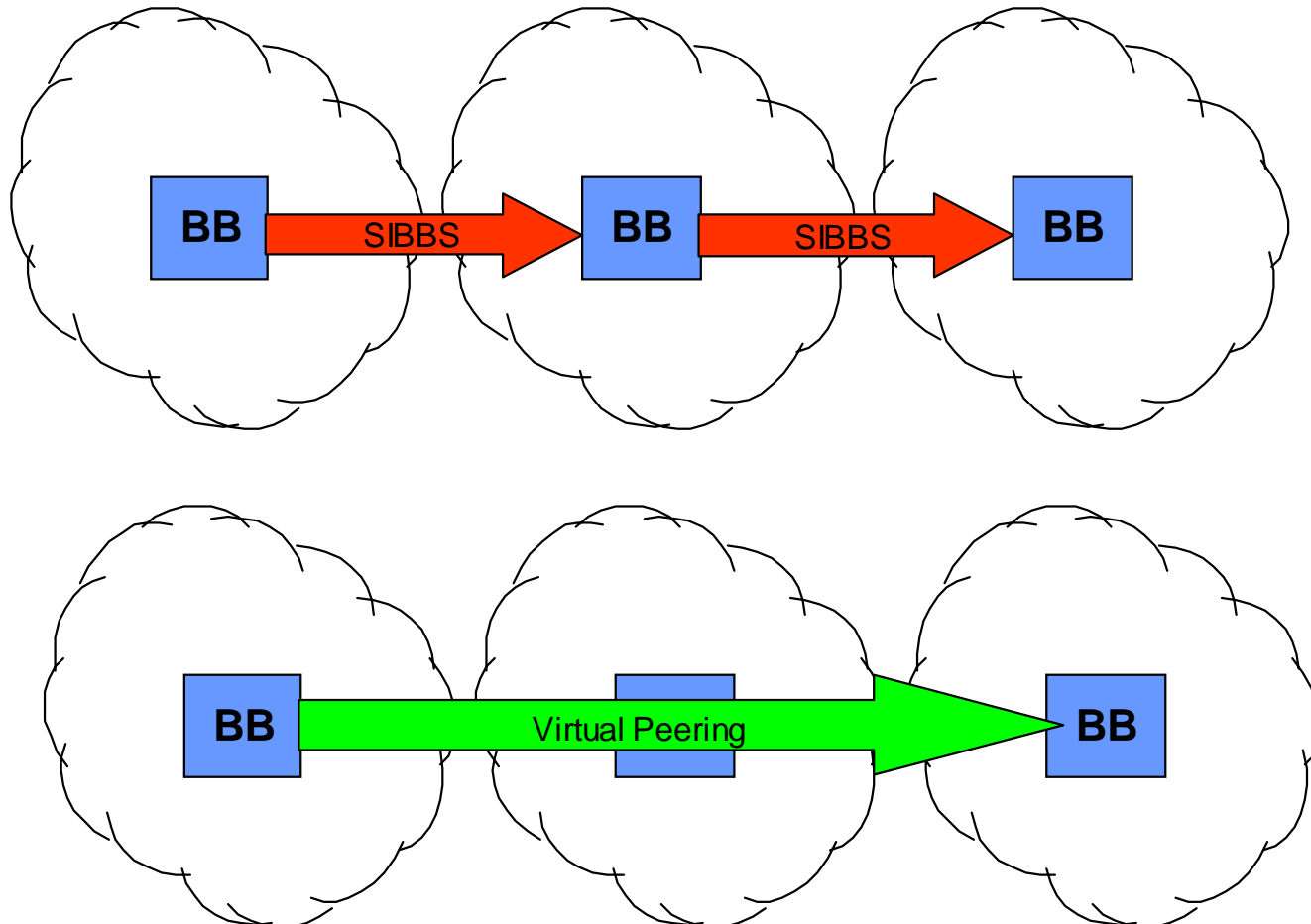
# Concept of Tunnels

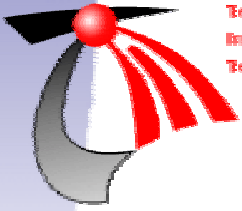


- One or both ends not fully specified
- Vehicle for aggregation of reservations
- Tunnel Types
  - Core (domain-domain)
  - Head (source-domain)
  - Tail (domain-dest)
- Tunnels vs. reservations
- Tunnels create “virtual peerings” between non-adjacent BBs

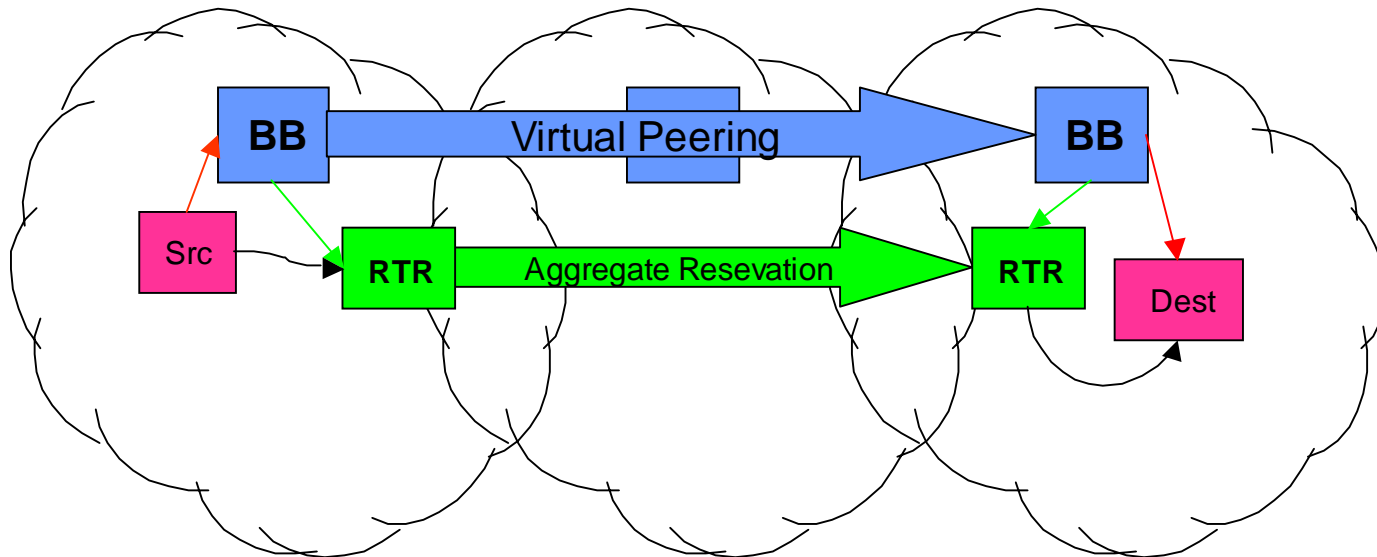


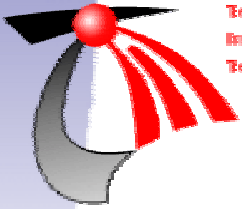
# Core Tunnel Setup





# Using the Core Tunnel





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# Some Key Research Questions

**Service Definitions**

**Mapping of GWSs to DS PHBs**

**Resource Allocation Strategies**

**Tunnel Triggering Mechanisms**

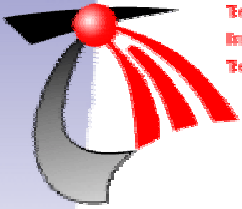
**Aggregation Algorithms**

**Reservation vs. Actual Use studies**

**Definition and Negotiation of SLSs**

**Measurement-based Mechanisms**

**Etc.**



# Conclusions and Future work

## It's a beginning, not a finished product

- Provides common language for domains to speak
- Sufficient room for experiment and extension
- Allow for individual domains and BB implementors to innovate

## Where do we go from here ?

- Functions still need work
  - Consider soft-state issues
  - Work out failure cases
  - Consider receiver-initiation
- Build it
- Experiment