Folie 1

E2ENP End-to-End QoS Negotiation Protocol

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International Workshop on Mobile IP-based Network Development

London, 7th October 2002

Folie 2

Outline

- **State of the art, status and problems**
- **QoS description and E2ENP**
- **E2ENP Basic elements**
  - **E2ENP Rationale**
  - **Building Valid QoS Contracts**
  - **Key E2ENP Concepts**
- **E2ENP Phases**
- **Implementation Aspects**
- **Use of E2ENP**
- **E2ENP and the MIND Basic Domain Model**
- **Conclusions**

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MIND

Folie 3

How can QoS be delivered end to end?

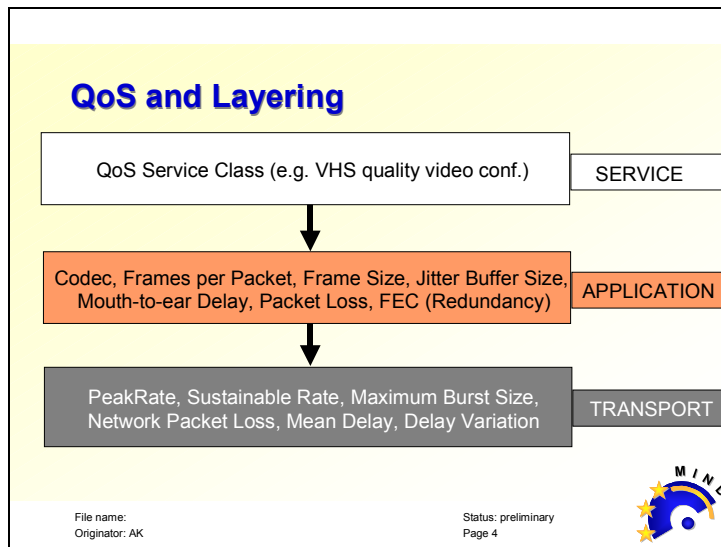- Distinguish
  - User/application layer QoS (application QoS signaling)
    - Typically signaled using SIP/SDP, SIP/SDPng, RTSP/SDP, …
  - Transport/network layer QoS (bearer QoS signaling)
    - Explicit signaling
      - Intserv like: RSVP
    - Implicit/No signaling
      - DiffServ like: COPS/PR
    - Heterogeneous
      - Use SIP to do implicit reservation
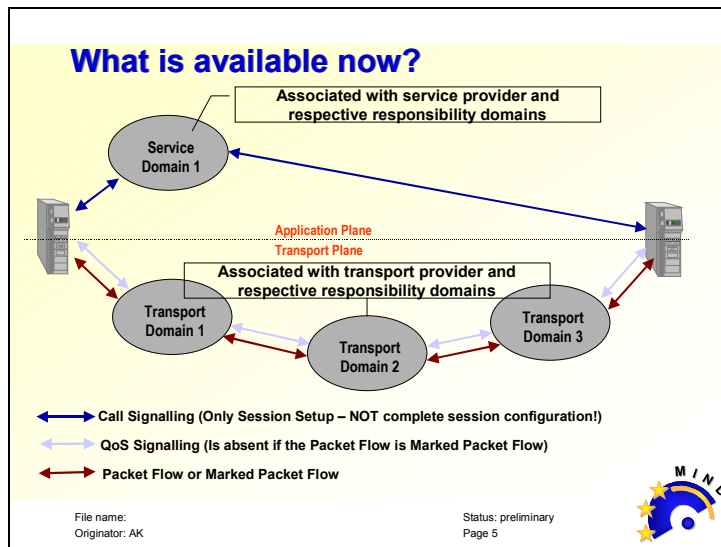
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M I N D

We need one slide to introduce the overall problem we are going to solve…

Folie 4

Need to introduce the problem domains: Distinguis between Service/application QoS issues and Transport QoS issues

Folie 5

This is the current internet model with SIP only for Session setup

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Problems with state of the art

- QoS Mechanisms
  - Not unique among transport domains →heterogeneous
- End-to-End requirements
  - Who establishes and controls them?
- How can we select QoS alternatives
  - Transport QoS vs. Application QoS?
- Service Provider involvement?
  - Not aware of the QoS signalling → No control
- Charging
  - Hard as service domain is not involved

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You may omit this slide and only tell the audience about…

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Uniform QoS description and E2E delivery

- **Mobility**
  - **Terminal may at any time move out of Transport domain**
    - **Requires to contact a new service domain at HO (May be too slow to support real-time)**
- **Message Sequence**
  - **Violates economy principle!**
    - **Network resources may be reserved without being used**
- **Re-negotiation for flows after session is established**
  - **Frequent negotiation (e.g. once per 8 sec.) of network resources for VBR flows**
  - **Session is established but still need to signal QoS**
  - **Consistency among „bearer QoS" and „call signalling QoS"**
- **Media and Configuration Dependency of application/bearer QoS**
  - **Service Domain must know mapping from codec to bearer QoS →scalable?**
    - **Bearer QoS requirements are included in call signalling (statistical bandwidth values)**
- **E2E QoS delivery**
  - **User/application layer QoS (application QoS signalling)**
    - **Typically signalled using SIP/SDP, SIP/SDPng, RTSP/SDP, …**
  - **Transport/network layer QoS (bearer QoS signalling)**
    - **Explicit signalling (IntServ like: RSVP)**
    - **Implicit/No signalling (DiffServ like: COPS/PR)**
    - **Heterogeneous (Use SIP to do implicit reservation)**

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M I N D

Now, what makes mobility so special about? What do we have to care about? You may omit this slide…

E2ENP Rationale

- **Challenges**
  - Both sedentary and mobile users **compete** for **scarce** resources
    - Especially when using multistream/multimedia services
  - **Reaction** to QoS violations must be **fast**
- **Solution: to properly plan actions ahead.**
  - Coordinate resource management: **Economy Principle**.
    1. Reserve local resources: **if** successful, **then**...
    2. ...Ask peer to reserve its local resources: **if** successful, **then**...
    3. ...Trigger all peers to make network reservations
  - Pre-negotiate Capabilities and QoS Adaptation Paths
    - Use hierarchical QoS specification to **layer** the negotiations
    - At re-negotiation time, peers use pre-negotiated contract identifiers

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M I N D

This is our motivation for doing E2ENP. You should NOT omit it!

Folie 9
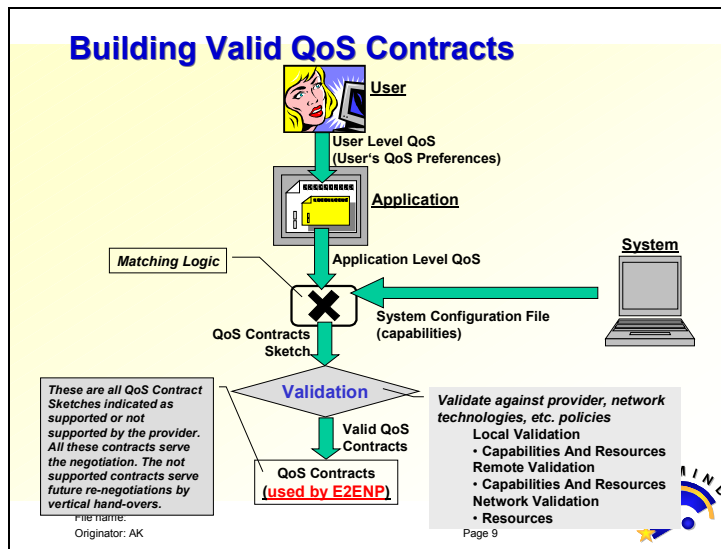
You may omit this slide. You have to introduce first a QoS contract,….

Folie 10

Key E2ENP Concepts

- E2ENP signalling nature
- E2ENP Phase
- Resource Management
- Stream Configuration Hierarchy
- Hierarchical Application-QoS Specification
- State-charts modelling
- Dynamic Application-QoS / Capabilities Re-Negotiation

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This is just an overview slide. It is good, but some of these points are detailed later. You may omit this slide

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E2ENP is a pure, media-independent, signalling protocol

- Distinction between data path and signalling path.
- E2ENP allows end-peers reaching an early agreement on:
    - WHAT capabilities to use and QoS levels to enforce.
    - WHICH alternative to choose upon QoS Violations, out of the negotiated ones
        - **Concept of Adaptation Path (AP).**
- Middleware/protocol stack will actually enforce the agreed QoS levels
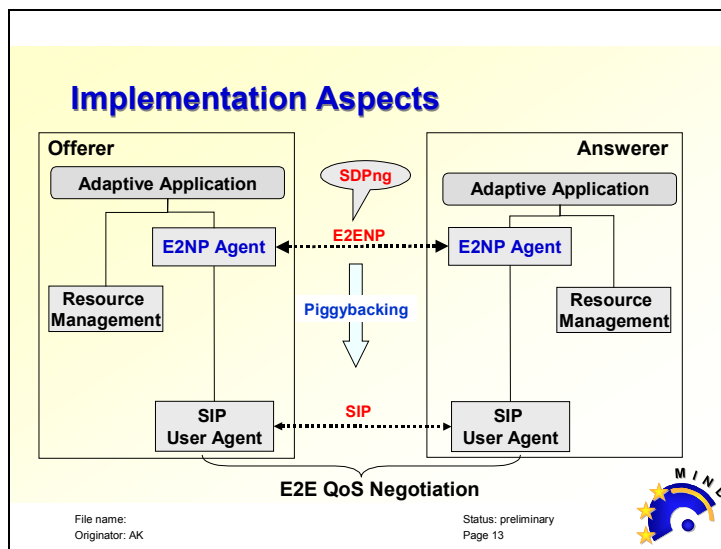   - E.g. the BRAIN/MIND Extended Socket Interface (ESI)
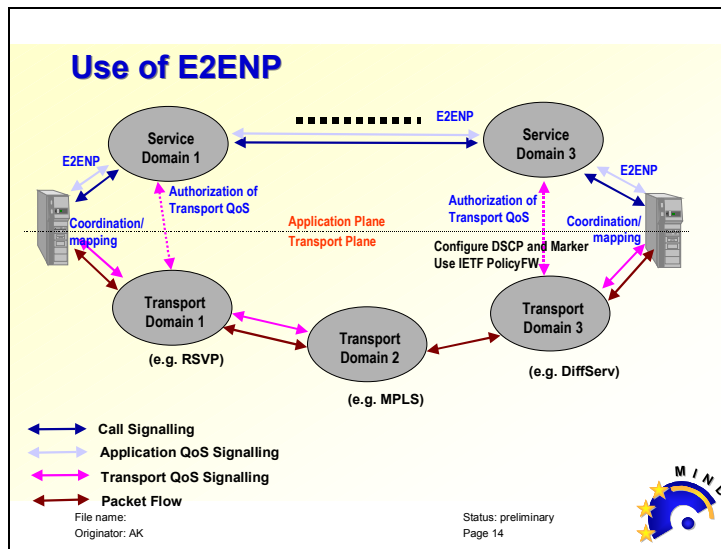
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This is one of the main E2ENP slide. Do not omit!

Folie 13
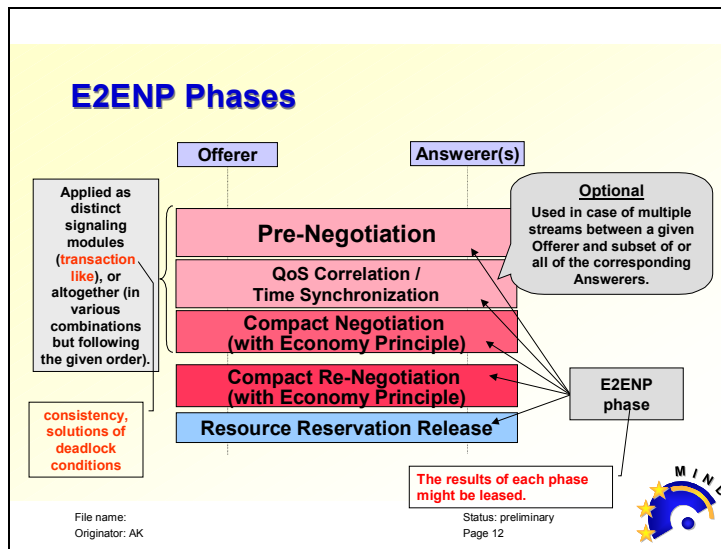
This is one of the main E2ENP slide. Do not omit! Mention, that the session descriptions are in an SDPng conform XML language piggybacked on SIP messages

This is how E2ENP can be used to coordinate Application and transport plane QoS negotiation. You may omit this slide!

Roles and categories of assets

- Identification business roles in MIND scenarios
- Domains
  - autonomous entity
  - contact others by reference points
- Mapping roles to domains

Role	Domain
User	Leaf Network
Subscriber	
Service Provider	Service Provider Network
Auxiliary Network Provider	Intermediary Access Network
Extended Network Provider	Access Network
Network Provider	Core Network
Application Service Provider	Application Service Provider Network

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Actually the transport domain mentioned in E2ENP should be the Intermediary Access Network, Access Network, Core Network.

Core Network includes cellular networks and core network.

Surely the relationship between different domains, presented by reference points, affect the negotiation in E2ENP.

Different roles are identified from MIND scenarios.

User, which is actually using the service, can be Stephanie and her colleagues

Subscriber, who has the contract with the service provider and pay for its user's usage. In the scenario the employer of Stephanie is the subscriber.

Auxiliary Network Provider, the user who provide routing and connectivity services to other users who can't connect to the access network directly.

Extended Network Provider, in the scenario it's the train company who organize the in train W-LAN

Service Provider, who has contract with users and other network and service providers and take care of all the subscription relationships. It's not necessary for a Service provider to have its own networks.

The following roles are quite common.

Administrative domains and their respective responsibilities are later identified., the reference points, which describe trust, relationships and interaction interfaces between them.

Role can be easily mapped to network domains, as described in the right table.

IAN, AN and CN are the transport domains described in E2ENP presentation.
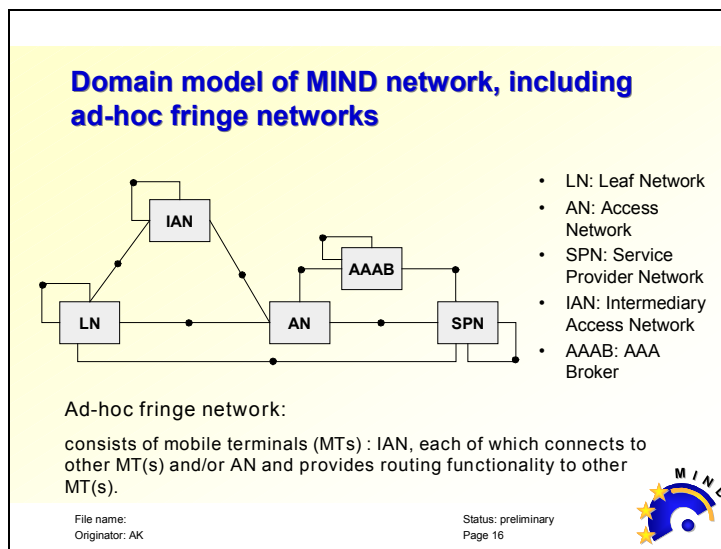
The domain model identify different administrative domains and the relationships between them. It's not describing network topology or architecture even though the network architecture can be included and explained by the domain model. Actually an administrative domain is an autonomous domain who take care of its own assets, benefits, profits. The emphasize is to define or identify the responsibilities and rights of each domain.

We describe the components and high level functionalities of each domain, what it can be, which service it can provide.

Then we describe the reference points. Each RP sit between two domains, which describes how they interact with each other, by which means, the protocol involved, and so on.

Elements

Intermediary Access Network: the mobile nodes with routing functionality and can provide routing and access service to other users (IAN or LN);

Leaf Network: which usually is a mobile terminal controlled by the user, but it can also be an ad-hoc network, for example a Personal Area Network of a user.

Reference points:

LN to AN;

AAA should mainly be done here.

LN to IAN;

there should be a trust relationship established between LN and IAN before IAN provides access service to LN;

IAN provides routing and access service to LN and receives reward from LN indirectly;

LN to LN;

in case that an ad-hoc network has been setup by end users themselves who trust each other (Stephanie and her colleagues on train scenario);

The reference points between the domains are useful for security and accounting works.

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Summary and Conclusion

- Coordination between Service Domain and Transport Domain is useful in some cases
- Flexible coordination is needed to support mobile and ad-hoc users
- E2ENP allows negotiation of capabilities and QoS based on common adaptation paths
- E2ENP uses several phases to support negotiation for multi stream multi session multimedia conferences
- E2ENP is based on SIP/SDPng
- Session Descriptions are in XML → extensible

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Acknowledgements

This work has been performed in the framework of the IST project IST-2000-28584 MIND, which is partly funded by the European Union. The authors would like to acknowledge the contributions of their colleagues from Siemens AG, British Telecommunications PLC, Agora Systems S.A., Ericsson Radio Systems AB, France Télécom S.A., King's College London, Nokia Corporation, NTT DoCoMo Inc, Sony International (Europe) GmbH, T-Systems Nova GmbH, University of Madrid, and Infineon Technologies AG.

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