Protocol Suites and Layering

David Morgan

Benefit of a “suite”

- Division-of-labor motivated
- Led to functional “layer” concept
- IP excelled at conjoining heterogeneous nets
- Nets therefore all implemented IP
Functional layering

THE 7 LAYERS OF OSI

NAIROBI

Kenyan philosopher
Swahili linguist
Delivery agent

TOKYO

Japanese philosopher
Japanese linguist
Delivery agent
Philosophical layer

NAIROBI

Kenyan philosopher

TOKYO

Japanese philosopher

- Nature of man
- Good versus evil
- The existence of God

Linguistic layer

NAIROBI

Swahili linguist

TOKYO

Japanese linguist

- Arabic
- Navajo
- French
- (or even, Swahili or Japanese)
Delivery layer

NAIROBI

Delivery agent

Shipping box

or

Diplomatic pouch

or

Carry-on backpack

or

Mailing envelope

TOKYO

Delivery agent

Functional layering

NAIROBI

Kenyan philosopher

Swahili linguist

Delivery agent

philosophy

language

package

TOKYO

Japanese philosopher

Japanese linguist

Delivery agent

philosophical layer

linguistic layer

delivery layer

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One possibility...

NAIROBI

Kenyan philosopher

Swahili linguist

Delivery agent

TOKYO

Japanese philosopher

Japanese linguist

Delivery agent

nature of man

Arabic

mailing envelope

... another possibility...

NAIROBI

Kenyan philosopher

Swahili linguist

Delivery agent

TOKYO

Japanese philosopher

Japanese linguist

Delivery agent

existence of god

Navajo

diplomatic pouch
...yet a third possibility ...

NAIROBI

Kenyan philosopher

Swahili linguist

Delivery agent

good versus evil

French

carry-on backpack

TOKYO

Japanese philosopher

Japanese linguist

Delivery agent

More likely ...

NAIROBI

Kenyan philosopher

Swahili linguist

Delivery agent

nature of man

ENGLISH

not Arabic

mailing envelope

TOKYO

Japanese philosopher

Japanese linguist

Delivery agent

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... and ...

**NAIROBI**

- Kenyan philosopher
- Swahili linguist
- Delivery agent

**TOKYO**

- Japanese philosopher
- Japanese linguist
- Delivery agent

**NAIROBI**

- existence of god
- ENGLISH

**TOKYO**

- not Navajo
- ENGLISH

**NAIROBI**

- diplomatic pouch

**TOKYO**

- carry-on backpack

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... and ...

**NAIROBI**

- Kenyan philosopher
- Swahili linguist
- Delivery agent

**TOKYO**

- Japanese philosopher
- Japanese linguist
- Delivery agent

**NAIROBI**

- good versus evil

**TOKYO**

- not French
- ENGLISH

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**Functional layering**

- **NAIROBI**
  - Kenyan philosopher
  - “Shauri ya mungu”
  - Swahili linguist
  - “It can’t be helped”
  - Delivery agent

- **TOKYO**
  - Japanese philosopher
  - “Shikata ga nai”
  - Japanese linguist
  - “It can’t be helped”
  - Delivery agent

**English**

- Carries any philosophical discussion
- Carried by any delivery technique
- “Language of commonality” - has become the standard for doing so
IP is like English

- Carries any application and end-to-end protocol (ftp, smtp, http…TCP, UDP)
- Carried by any data link and physical technique (ethernet, ATM, frame relay, wireless)
- “Layer of commonality” - has become the standard for doing so

IP - common protocol
Layer-wise encapsulation

<table>
<thead>
<tr>
<th>data link header</th>
<th>payload/cargo/freight</th>
</tr>
</thead>
<tbody>
<tr>
<td>network header</td>
<td>payload/cargo/freight</td>
</tr>
<tr>
<td>transport header</td>
<td>payload/cargo/freight</td>
</tr>
</tbody>
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