Mobile Adaptive Computing:

Most mobile systems (problem) are distributed systems (problem).

What distinguishes traditional DS:

1. If one views the problem of MS as traditional DS problem then it might be intractable e.g. routing, one may pre-compute all possible paths and use them as alternate paths upon failure of primary path.

2. But in case of MS the possibilities may be even more.
2. Usually in DS, the nodes have sufficient resources:
   - memory
   - processing capability
   - energy
   - display (I/O capability)
   - link bandwidth (quality)

However, in MS we see wide disparity between different components of the system.
How to deal with temporal/spatial disparity in system design?

- MU has to deal with changing "environment" to continue to provide services to the user.

- Example: Its connectivity to the network may vary from high to low latency.
  - Application: Mobile Information Access
  - Changing Roles: Client → Server
Extended Client-Server Model.

Thin Client Model


In general, the MO needs to adapt to the changing environment.

**Types of Adaptation Schemes:**

- **Static (Compile/Design time)** (Refining)
- Parallel m/c's adapting to different processes
  - m/c type (Retarget)
  - Characteristics of input data set
  - Application domain
  - Geometric graph problems
Dynamic (Runtime)
- Pre-programmed to deal with different situations
- To dynamically update the functionality (Java, dynamic linking)
- Reprogram the system (e.g., applets, sensor nodes)

Static \rightarrow Evolution \rightarrow Dynamic (Learn)

What to Adapt: Functionality vs. Data
(Input/output, adapt to bad connection)
- Low res., c/s performance
- Downgrade video quality, reduce consistency requirements
transcoding - scheme for adapting data

Transcoding proxy (IBM)
- Dynamically transcode web page to display on different types of devices connected via different quality link.

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System design principles
- Separation of mechanism & policies
- Separation of mechanism & policies

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Policy Module
- Adaptive transcoding policy (decides when & how much to transcode)

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Content Analyzer
- HTML
- Size (S)

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Text
- Text + Modification
- Compressed
- Transcoded Image
- Image
- Transformed Image
- Sp(S)

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Normalized access path
- Normal access path
- Normal access path
- Normal access path

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Web Server
- Web Server
- S.to-P bandwidth, Bsp,p

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Step
- Step
- Step
- Step

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Dse
- Dse
- Dse
- Dse

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P.to.c
- P.to.c
- P.to.c
- P.to.c

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Web Client
- Web Client
- Web Client
- Web Client

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Modified text/HTML
- Modified text/HTML
- Modified text/HTML
- Modified text/HTML

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Modified text/HTML
- Modified text/HTML
- Modified text/HTML
- Modified text/HTML
\[ D_{sc} = 2 \left( RTT_{pc} + RTT_{sp} \right) + \frac{S}{\min(B_{pc}, B_{sp})} \]

\[ D_{spc} = \frac{2 \times RTT_{pc} + 2 RTT_{sp} + D_{p}(S) + S}{B_{pc}} + \frac{S_{p}(S)}{B_{pc}} \]

TCP handshake:

1 RTT

+ another RTT to data transfer

\[ D_{spc} \leq D_{sc} \Rightarrow S > \left[ \frac{D_{p}(S) + S_{p}(S)/B_{pc}}{(1/B_{pc} - 1/B_{sp})} \right] \]
Assignment 3 will be posted tonight.