

***Do current WWW Protocols work
over Wireless and Small Screen
Devices?***

Gabriel Montenegro

gab@sun.com

Sun Microsystems Laboratories

IAB Wireless Internetworking Workshop

3/2000



yes

- **questions?**

Outline

- **Some Background**
- **Network Characteristics**
- **Implementation Constraints**
- **Handling platform challenges**
- **Handling network challenges**
- **Going forward**

Some Background

- **Mobile Network Computer Reference Specification (MNCRS) - aka *Mobile Dodo***
 - Mobile Communications working group
 - Mobile IP (home addr discovery, chained/surrogate tunnels)
 - Messaging Middleware

<http://www.mncrs.org/>
<http://computer.org/internet/v2n1/mncrs.htm>
- **Open networking protocols *FROM* the IETF**
 - Performance Implications of Link Characteristics (PILC)

<http://www.ietf.org/html.charters/pilc-charter.html>
- **Open Web Layers *FROM* W3C**
 - Mobile Access Interest Group

<http://www.w3.org/Mobile/Group/IG/>

Network Characteristics

- Long Thin *Wireless* Networks (GPRS, CDPD, TDMA, GSM, CDMA, Metricom, DoCoMo, PHS, ...)
- Latencies typically >400ms
- Low Bandwidth (<30Kbps), small delay*bandwidth product(increasing)
- Typical architecture:
 - mobile device, connected via a long thin wireless link to an...
 - intermediate system (base station/proxy)
 - legacy servers
- Stationary or semi-stationary usage
- **BUT: 10/100BT/802.11 (and no proxy) is also possible!**

Implementation Constraints

Devices are less than 512KB:

- **Size of embedded stacks (usually TCP/IP <15KB)**
 - KA9Q (Phil Karn) ~ 12KB
 - TCP: 10KB
 - IP: 1.8KB
 - PPP: 14KB
 - Smartcode Embedded NetCore IP ~ 14KB
<http://www.smartcodesoft.com/service/service.html>
 - STN~ 30KBwith PPP
<http://www.stnc.com>
 - IPv6 *functional* implementation in ~10KB of C
- **Amount of available bandwidth**
 - 512bps, 4Kbps, 9.6Kbps, 14.4Kbps, 20Kbps

Handling platform challenges

- **Stack Autotuning to set recv/xmit buffers**
<http://www.psc.edu/networking/auto.html>
- **TCP control block interdependence (RFC 2140)**
- **Proxies: an optional optimization**
 - Offload public-key operations? Risky and perhaps unnecessary
 - Offload image processing/filtering
 - Firewall traversal
 - Interface to back-end email/calendar/dbases
 - v4/v6 interface?
 - Amortize your tcp connection establishment

Handling platform challenges (2)

W3C Mobile Access Interest Group

- **HTML 3.2 subsets**

- usually just works: mapquest.com, yahoo.com, www.eltiempo.com, www.svoboda.org/, www.yahoo.co.jp, etc

- **Compact HTML**

- <http://www.w3.org/TR/1998/NOTE-compactHTML-19980209/>*

- **HTML 4.0 Guidelines for Mobile Access**

- <http://www.w3.org/TR/NOTE-html40-mobile/>*

- **Just use pdQBrower, HandWeb, Palmscape...**

- **AvantGo model**

- **I-Mode !!! 4million in under a year, content explosion**

Handling network challenges

In long-thin networks (RFC 2757), SLOW, ERROR and LINK, independent of V4 versus V6:

- **Improve the link with FEC and retransmits**
- **Implement error-resilient header compression (RFC2507,RFC2509)**
 - V6 is more compressible (no IP header checksum)
- **Path MTU discovery (RFC1191)**
- **TCP's initial window to 2 segments (RFC2414/2581)**
- **ACK without delay the first segment in a new connection (expensive?)**
- **for 3G: SACK (RFC2018) and DSACK (or NewReno)**
- **Infrastructure: ECN (RFC2481) and RED (RFC 2309)**

Going Forward (1 of 3)

- **HTTP1.1**
 - **NO CLEAR FUTURE OPTION HERE!!!!**
 - **persistent connections (vs T/TCP)**
 - **“Content-Encoding: deflate” and “Accept-Encoding: deflate”**
 - **<http://www.w3.org/Protocols/HTTP/Performance/Pipeline.html>**
- **TLS allows for compression!**
- **Steve Bellovin’s TCP filters include compression**
- **TCP filters-->”IPCP for TCP”?**
- **Generalized XML tokenization (like WML’s)**
 - **using any of the above compression negotiations**
- **Handle options better in header compression**
- **UDP-Lite for voice?**

Going Forward (2 of 3)

- **Modularization**

- XHTML Basic
- XHTML Mobile Profile

- **Transport options**

- T/TCP?
- Will http1.1 deliver?
- SCTP?
- Endpoint Congestion Management
- Ensemble TCP?
- TCP for wireless mostly under control (PILC item), but the real problem is:

HTTP!!! HTTP-NG is dead, where to go now?

Going Forward (3 of 3)

- **Security for small devices**

- TLS in small devices (definitely doable, prototyping work under way)
- RSA may have some advantages over ECC after all:
crypto.stanford.edu/~dabo/abstracts/PalmPilotWallet.html
- NTRU?

- **Non-Congestion related Loss**

- “network unreachable”
- “freeze tcp” - advertising Rx window of 0 and growing it back up
- “network reachable”
- “corruption experienced”

Conclusion

Open protocols:

- **are small enough**
- **are adaptable and most definitely *NOT* broken**
- **benefit from open review by world experts (IETF, W3C)**
- **are public and openly implementable**
- **allow optional proxy services, but do not require them**
- **do not break the end-to-end principle (so IP security would work, for example)**
- **are scalable much beyond current wide-area wireless bandwidths**