



Mobile Satellite Protocol Testbed

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Outline

- ◆ Introduction
 - Challenges to interoperability.
- ◆ The Mobile Satellite Protocol Testbed
 - Goal
 - The Mobile Satellite Channel
 - Testbed Capabilities:
 - + Accurately model the satellite channel using propagation data.
 - + Real-time test capability allows qualitative analysis.
 - + Modified versions of standard TCP tools provide detailed logs.
 - Testbed Design
- ◆ Example Results



Challenges to Interoperability

- ◆ Terrestrial Networks
 - High bandwidth
 - Low Delay
 - Low Bit Error Rate

- ◆ Satellite Networks
 - Range of bandwidths (mobile to VSAT)
 - Longer Delays (LEO MEO GEO)
 - Higher Bit Error Rates (mitigated by coding)
- ◆ Mobile Satellite Networks
 - Low bandwidth
 - Higher BER

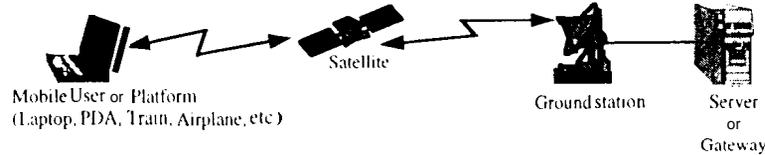


The Mobile Satellite Protocol Testbed

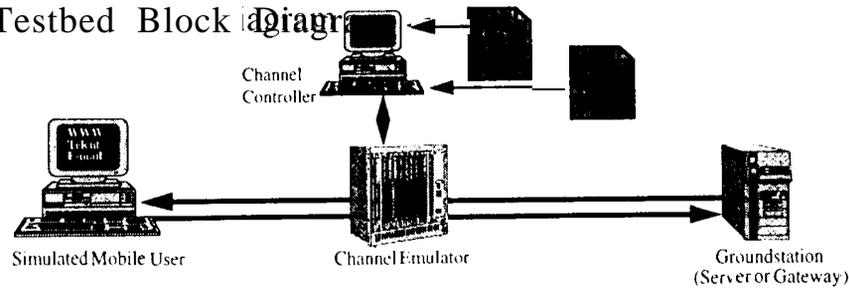
- ◆ Goal: To assess and compare the various TCP and ATM mods in a mobile satellite environment and to provide the results to manufacturers of TCP and ATM protocol stacks.
- ◆ The Mobile Satellite Channel:
 - Propagation delay to orbit is considerable (- 130ms for CEO).
 - Higher BER than fixed satellite channels
 - + Mobiles are power-constrained and have smaller antennas.
 - + Coding helps, but low data rate and processing constraints may limit its applicability.
 - + The mobile channel is subject to Multipath Fading & Shadowing

Testbed Design

◆ Mobile System Being Simulated



◆ Testbed Block Diagram



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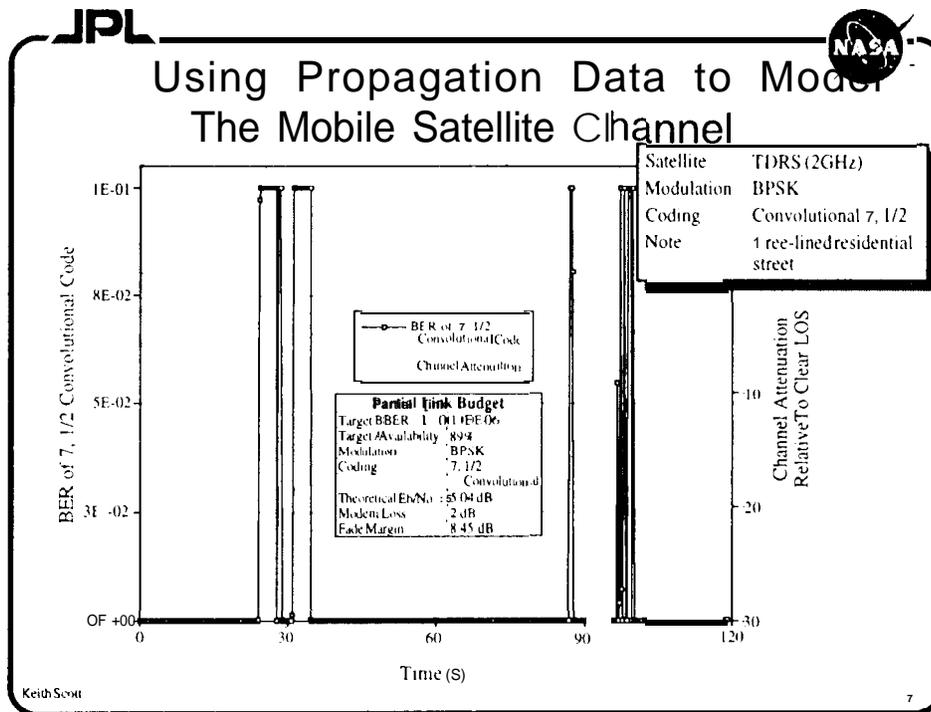
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Testbed Capabilities

- ◆ Hardware channel simulator, driven by propagation data, provides an inexpensive, accurate, and repeatable platform.
 - Land, Aeronautical, and Marine Mobile channels.
 - Cannot model any IF phenomena (carrier lock, etc.).
- ◆ Qualitative as well as quantitative feedback.
 - Real measurements are essential to understanding TCP behavior.
 - Real-time simulation allows qualitative analyses that are essential, since many of the driving applications behind the deployment of TCP and ATM over satellites are interactive (http, telnet, e-mail).

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- ## TCP Enhancements Being Examined
- ◆ **Selective Acknowledgements (RFC 2018)**
 - Provides an option to include selective acknowledgements as apposed to TCP's normal cumulative acknowledgement scheme.
 - ◆ **Large Windows and PAWS (RFC 1323)**
 - Allows TCP to have more than 65k 01' data in flight at any one time. This may not be necessary for low-rate mobile terminals.
 - **Space Communications Protocol Standards (SCPS)**
 - SCPS is an end-to-end protocol developed by NASA for near-earth and deep-space missions, anti contains many improvements to TCP that are relevant to the satellite environment.
 - **Bellcore's Protocol Boosters**
 - Bellcore's Forward Error Correcting (FEC) protocol booster provides improved resistance to errors below the network level.
- Keith Scott

