The TETRA Rail Forum

Robin Davis
Chairman
TETRA Rail Forum
Welcome
Agenda

• TETRA Rail Market Situation
• Objectives of the Forum
• GSM(R) & TETRA
• Closing Thoughts
TETRA has been adopted by many Railway Clients including:

- London Underground
- Dubai Metro, UAE
- Bilbao Metro, Spain
- Copenhagen Metro
- French SNCF
- Bangkok MRTA
- Hong Kong KCRC
- Malaysia Express Rail Link
- Singapore Mass Rapid Transit
- Taiwan National Railway
- Hong Kong MTRC
- Taiwan High Speed Rail

Abu Dhabi 2011
The Facts

- **TETRA is currently the most popular radio technology in Metro/Urban systems.**
- **Almost 100% of new digital mobile radio deployment in Urban Rail & Metros rely on TETRA.**
- **Today 25% of the world market for TETRA is in Rail.**
- **TETRA is a proven competitor over GSM(R).**
Objectives of the Forum
• In July 2006 the TETRA Association created the TETRA Rail working group.

• Today > 25 Members from Industry

• Aims and Objectives are:
  – To consolidate the Rail needs for voice & data
  – To learn from the existing applications for Metros/Urban Rail and Railways
  – To identify the eventual “gap” between TETRA present features plus near future TETRA road map and the Rail requirements
  – To add this information to the TETRA Association website

  www.tetraassociation.com
Will TETRA ever replace GSM(R)?
The Requirements

Complex Requirements

High Speed
Passenger Density
Environments Mix
Safety Critical
Voice & Data Requirements
Data Intense
Limited Stopping

Communications Requirements

Radio Train Mobile
Radio Hand-held
Public Address
Passenger Call
Telephony
Mobile Data
Telemetry
Train Status Information
Remote Controls
Alarms
Passenger Information
Signalling
**TETRA Instead of GSM(R)**

Are there design elements that are particular & proprietary to GSM-R?

<table>
<thead>
<tr>
<th>GSM(R) Data</th>
<th>TETRA</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Call setup</strong> &lt; 5 sec (95%)</td>
<td>✓ yes <em>(GSM is actually slow)</em></td>
</tr>
<tr>
<td>• <strong>Connection failure probability</strong> &lt; 10-3</td>
<td>✓ yes <em>(Radio engineering)</em></td>
</tr>
<tr>
<td>• <strong>BER</strong> &lt; 10-4 for 90% of the time</td>
<td>✓ yes <em>(Radio engineering)</em></td>
</tr>
<tr>
<td>• <strong>Maximum end to end delay</strong> &lt; 0.5 sec (95%)</td>
<td>✓ yes on a single switch *</td>
</tr>
<tr>
<td>• <strong>Average end-to-end delay</strong> (30 Octet frame) 400 to 500ms</td>
<td>✓ yes on single switch</td>
</tr>
<tr>
<td>• <strong>Probability of connection loss</strong> &lt;10-4</td>
<td>✓ <em>(Radio engineering)</em></td>
</tr>
<tr>
<td>• <strong>Maximum break during handover</strong> &lt; 300mS</td>
<td>1.4 sec <em>(improve with eng, system loading &amp; BS sync ?)</em></td>
</tr>
<tr>
<td>• <strong>Connection loss indication time</strong> &lt; 1 sec</td>
<td>✓ <em>(Radio engineering)</em></td>
</tr>
<tr>
<td>• <strong>Availability</strong> &gt; 99.95%</td>
<td>✓ <em>(System engineering)</em></td>
</tr>
<tr>
<td>• <strong>Interface at network ISDN PRI</strong></td>
<td>✓ <em>(Engineering)</em></td>
</tr>
<tr>
<td>• <strong>Interface on the train V.24</strong> <em>(non mandatory)</em></td>
<td>✓ yes</td>
</tr>
<tr>
<td>• <strong>Data rate</strong> <em>(2.4 or 4.8kb/s)</em></td>
<td>✓ yes</td>
</tr>
<tr>
<td><em>(Requirement deliberately set low to reduce errors &amp; retransmissions requests)</em></td>
<td><em>(Requirement deliberately set low to reduce errors &amp; retransmissions requests)</em></td>
</tr>
</tbody>
</table>

The answer is substantially No.
## TETRA Instead of GSM(R)

### Are there design elements that are particular & proprietary to GSM-R?

<table>
<thead>
<tr>
<th>GSM(R) Voice</th>
<th>TETRA</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Individual Call</td>
<td>✓ yes (standard in trunking systems)</td>
</tr>
<tr>
<td>• Duplex calling</td>
<td>✓ yes</td>
</tr>
<tr>
<td>• Group Call</td>
<td>✓ yes (GSM-R is light in this area)</td>
</tr>
<tr>
<td>• Voice broadcast call</td>
<td>✓ yes</td>
</tr>
<tr>
<td>• Location dependant addressing</td>
<td>✓ yes with GPS &amp; dynamic regrouping</td>
</tr>
<tr>
<td>• Functional addressing &amp; display</td>
<td>✓ yes with despatch and on-board systems</td>
</tr>
<tr>
<td>• Priority services</td>
<td>✓ yes</td>
</tr>
<tr>
<td>• Acknowledgement centre</td>
<td>✓ yes</td>
</tr>
</tbody>
</table>

*The answer is substantially No.*
Is it all about the safety case?

- **Relevant Safety related ETSI standards**
  - Railway Applications – Communications, Signalling and
  - Processing Systems – Safety related Electronic Systems for Signalling (EN 50129, EN 50129-1, EN 50129-2) the last two standards refer to additional conditions for data Communications
  - RAMS (EN 50126)
  - Railway Applications – Communications, Signalling and
  - Processing Systems – Safety related Software Systems for
  - Signalling (EN 50128), this standard refers to additional conditions for Software

- **Main Objective**
  - To specify those life-cycle activities which shall be carried out and successfully completed before and after the system acceptance.

- **Question?**
  - The UIC In Europe has made its decision a while ago on GSM(R), but why can’t a local rail operator undertake a pilot and create their own safety case for long haul railways?
  - Is this an opportunity for Middle East and Asia Rail Operating Companies?
In Closing
TETRA in Rail

- **TETRA** is successfully deployed in a wide variety of railway applications worldwide.

- **TETRA has the functionality to meet the requirements of the rail operator.**

- **The continued development of TETRA with TEDS and other applications will provide operating benefits to the transportation industry around the world.**

- **GSM(R) is the chosen technology for Europe, but there is no reason why other long haul rail operators cannot create their own safety cases and seek approval from local rail safety regulators.**

Abu Dhabi 2011
Thank You
Robin Davis
Chairman TETRA Rail Forum
And
Projects Director
Actica Consulting Ltd
Email: robin.davis@actica.co.uk
Telephone: + 44 7901 855605