Records, Segment Records, Activity Report Records and Event Report Records are described below.

**Audit Records**

An audit record provides an overall summary of a call. One audit record may cover a single call that covers multiple systems (e.g. inter-system handoff). In other cases, multiple audit records may be generated (e.g. inter-system call delivery and call waiting).

The information in an Audit Record includes:

- Unique record identification (system identification and a unique intra-system record serial number (BIN)).
- Subscriber identification (MIN and ESN).
- Time and duration of call.
- Number of associated leg and segment records and charge sub-records.
- Type of call.

**Leg Records**

A leg record provides information relevant to a single leg of a call. Calls have at least one leg record created in each MSC that supports the call. Calls may have more than one leg record associated with them.

The records that describe various aspects of calls and other activities.

**Remote Operations**

How IS-124 controls the exchange of information in the network.

**IS-124 Acronym Confusion**

Dazzle 'em at your next cocktail party by dropping terms like NSDPF and DMH-lite and actually know what they mean.

**Field Trials**

The likely route from field trials to widespread implementation.

**Summary of IS-124 ("DMH") Equipment & Service Vendors**


**Protocol Layers**

IS-124 is a multi-layered protocol. The top layer contains the call detail information, such as: times, durations, phone numbers, radio channel identification information and charge information. Below this layer is the ROSE standard (ITU-T Recommendation X.219 and X.229) for message structuring and for the control of Remote Operations.

These remote operations allow the controlled transfer of information between network nodes. The lower layers can be virtually any combination of physical and transport protocols (e.g. X.25 or TCP/IP).

**Call Detail Record Types**

IS-124 specifies five types of call detail records that contain information about different aspects and portions of a single call. The relationships between these record types are shown in a simplified fashion in Figure 1. The purpose and contents of Audit Records, Leg Records, Segment Records, Activity Report Records and Event Report Records are described below.

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- Number of associated leg and segment records and charge sub-records.
- Type of call.
A Segment Record contains the following information:

i. Unique record identification (same as audit record plus a segment sequence number).

ii. Subscriber identification.

iii. Time and duration of segment.

iv. Identification of radio channel, inter-system (handoff) trunk or other facility.

v. Type of segment.

Activity Report Records

Activity records describe subscriber activity that is associated with radio contact, but not with the long term allocation of a facility, such as registration and deregistration. An Activity record generated at an MSC may be associated with an Event Record generated at an HLR. Activity records may also be included with call related information. Information included in

have multiple leg records within a single MSC for several reasons:

a. Inter-system handoff involving path minimization.

b. Call redirection due to no page response or no answer.

c. Three way calls (one extra leg for the add-on party).

d. Multi-party conference call (one leg for each add-on party).

e. Call waiting.

Information included in a Leg Record is:

i. Unique record identification (same as audit record plus a leg sequence number)

ii. Subscriber identification

iii. Time and duration of leg.

iv. Calling and called party identification, location and routing information, as available.

v. Type of leg.

Segment Records

Segment records provide information relevant to the usage of a single radio or inter-system trunk facility. A leg record will have no associated segment records for calls without any radio channels (e.g. the Originating MSC call record for call delivery and some types of call forwarding). Calls involving radio resources will generate at least one segment record. Multiple segment records may be associated with a single leg record under the following circumstances:

- Handoff within a single MSC, if this level of detail is retained.
- Handoff forward to another MSC.
- Handoff back to the Anchor MSC.
- A change in call mode from analog to digital or vice-versa.
- A change in voice privacy status from encrypted to clear or vice-versa.

A Segment Record contains the following information:

i. Unique record identification (same as audit record plus a segment sequence number).

ii. Subscriber identification.

iii. Time and duration of segment.

iv. Identification of radio channel, inter-system (handoff) trunk or other facility.

v. Type of segment.
Activity Report Records is:

i. Unique record identification (system identification plus a record identification number (RIN)).
ii. Type of activity (e.g. registration, feature activation).
iii. Time of activity.
iv. Subscriber identification.
v. Activity-specific details.

**Event Report Records**

Event records describe an operation that is not directly a result of subscriber or terminal radio contact. These may be generated by an HLR, for example, to record all changes to a subscriber profile whether due to a remote activity by the subscriber (which will generate an Activity record elsewhere) or due to a service order. The information included in an Event Record is:

i. Unique record identification (system identification plus a record identification number (RIN)).
ii. Type of event.
iii. Time of event.
iv. Subscriber identification.
v. Event-specific details.

**Remote Operations**

IS–124 defines message delivery packages using the ROSE remote operations protocol (ITU-T recommendations X.219 and X.229). This layer of the IS–124 protocol resides above the physical/transport layers and below the application layer containing call information.

Remote operations are structured in a very similar way to the TCAP used in IS–41. Each operation consists of an INVOKE message to initiate the operation, followed (except in the case of Uncertified Delivery) by a RETURN RESULT to indicate successful completion of the operation or a RETURN ERROR to indicate a failure. REJECT messages can be used to respond to incorrectly structured messages. Also as in TCAP, parameters within an operation message are prefixed by parameter identification and length information. Figure 2 provides a somewhat artificial example of how these operations might be used.

IS–124 message structuring is more sophisticated than IS–41 in its use of structuring to combine multiple call records into one operation (e.g. an audit record, 2 leg records and 3 segment records all relating to the same call may be sent as one CertifiedDelivery or UncertifiedDelivery operation). This allows records to be logically separated in the standard, but included together on the data link to improve throughput and reduce the processing and storage necessary to recombine records. Efficiency is further increased by eliminating redundant identification information that is the same in all records associated with the same call.

The Remote Operations defined in IS–124 are listed below.

**Aggregate Delivery**

This remote operation sends aggregate call record information (i.e. cumulative totals and record number ranges) from a CDGP to a CDCP (over the J interface).

**Aggregate Request**

This remote operation allows a CDCP to request aggregate information from a CDGP (also over the J interface).

**Certified Delivery**

A remote operation that allows the reliable transfer of information over the J interface (from CDGP to CDCP). Messages that are not acknowledged will be retransmitted.

**Uncertified Delivery**

This remote operation transfers the same information as a CertifiedDelivery, but does not require a response. It is more efficient, but only acceptable if the information being transmitted is not considered critical.

**Record Request**

This remote operation allows a CDCP to request one or more records from a CDGP (over the J interface).
Retransmission Request
This remote operation allows a CDCP to request retransmission of one or more records from a CDGP (over the \( J \) interface).

Rate Request
This remote operation, the only one on the \( K \) interface (from CDGP to CDRP), requests rating information for one or more call records. This operation allows preliminary local rating to be performed at a CDRP, to be modified at will by the billing system attached to the CDCP associated with the home system.

Field Trials
IS-124 was published by the TIA in September, 1993, yet it is still only in the early stages of implementation. McCaw has DMH-lite implemented extensively for fraud management purposes and will likely migrate to NSDPF when that subset is finalized. US West has tested IS-124 and is ready to use it, but has no partner to connect to at present. We can expect their first connections to another carrier to be with their business partner AirTouch. Implementation of IS-124 will occur in two phases, first to tackle fraud and then billing and inter-carrier settlement. This does not imply that billing or settlement is less important, but just that the requirements are more stringent. While fraud detection systems can work well with imperfect information, billing systems have to achieve an extremely high level of accuracy. Carriers will want to be sure that (almost) no calls go unbilled, get billed twice or billed inaccurately. Requirements for inter-carrier settlement (bulk compensation for the sharing of facilities between carriers based on wholesale rates) will be almost as stringent.

Field trials of IS-124 fraud applications will occur following finalization of the NSDPF subset document (scheduled for June 1995). It will be published by Cibernnet. Following that, the billing subset will be finalized, hopefully by the end of 1995. This document will have a significant impact on IS-124 Revision A, as several errors have been found in IS-124 Revision 0 during the development of NSDPF. Work on IS-124 Revision A may have to be well under way before billing application field trials of IS-124 can begin. Another hurdle to be overcome before widespread implementation of IS-124 for billing will be upgrading the \( I \) interface from a CDIS (e.g. MSC). While this will remain a proprietary interface, it is the source of most IS-124 information. It is likely that all manufacturers of MSC’s will require modifications to their AMA/CDR formats to allow accurate billing via IS-124.

IS-124 billing field trials will first begin between carriers within the US and within Canada. Following that US-Canada international field trials will occur, tackling the currency exchange problem. Only then will field trials outside North America (e.g. Mexico, South America and Asia) likely be considered. These will have to deal not only with currency exchange, but also with significant telecommunications differences between the North American Numbering Plan area and other parts of the world.

Summary
Once the very substantial implementation hurdles have been overcome, the IS-124 standard will prove to be as essential to the operation of cellular and PCS downstream processing systems as IS-41 has come to be for call processing. The table on Page 5 indicates substantial activity in this area.
## Summary of Cellular TIA IS-124 (“DMH”) Networking Equipment & Service Vendors

**Editor David Crowe • Phone 403-289-6609 • Fax 403-289-6658**

### CDIS: Call Detail Information Source

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Several</td>
<td>The most common information source is an MSC (MTSO). Others are MC, HLR, AC and VLR.</td>
</tr>
</tbody>
</table>

### CDGP: Call Detail Generation Point

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Name</th>
<th>Comments</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coral</td>
<td>FraudBuster GP</td>
<td>Collects data from Motorola, AT&amp;T, Astronet, Ericsson, NT and NovAtel from tape or in real-time</td>
<td>NSDPF</td>
</tr>
<tr>
<td>GTE</td>
<td>TransAction Manager</td>
<td>Collects data from Motorola, AT&amp;T, Astronet, Ericsson, NT and NovAtel from tape or in real-time</td>
<td>NSDPF</td>
</tr>
<tr>
<td>Securicor Wireless Networks</td>
<td>SecuriNet CDGP</td>
<td>Full IS-124 stack, demonstrated at Wireless '95 Networks</td>
<td>IS-124</td>
</tr>
<tr>
<td>Systems/Link</td>
<td>Collector Box</td>
<td>Collects data from Ericsson, AT&amp;T, Motorola and NTI in real-time</td>
<td>NSDPF, DMH-lite</td>
</tr>
</tbody>
</table>

### CDRP: Call Detail Rating Point

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Name</th>
<th>Comments</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTE</td>
<td>Cell-U-Rator</td>
<td>Message Rating Services</td>
<td>NSDPF</td>
</tr>
<tr>
<td>Securicor Wireless Networks</td>
<td>SecuriNet CDRP</td>
<td>IS-124 stack to feed rating engine</td>
<td>IS-124</td>
</tr>
</tbody>
</table>

### CDCP: Call Detail Collection Point

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Name</th>
<th>Comments</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coral</td>
<td>Churn Alert</td>
<td>Monitors calling and mobility patterns for customer care</td>
<td>NSDPF</td>
</tr>
<tr>
<td></td>
<td>FraudBuster</td>
<td>Uses calling profile to detect fraud</td>
<td>NSDPF</td>
</tr>
<tr>
<td>GTE</td>
<td>ChurnManager</td>
<td>Proactive &amp; Reactive Customer Retention System</td>
<td>NSDPF</td>
</tr>
<tr>
<td></td>
<td>CloneDetector</td>
<td>Uses calling profile to detect cloning and subscription fraud</td>
<td>NSDPF</td>
</tr>
<tr>
<td>Securicor Wireless Networks</td>
<td>SecuriNet CDCP</td>
<td>IS-124 stack to feed custom applications. Demonstrated at Wireless '95 (February, 1995).</td>
<td>IS-124</td>
</tr>
<tr>
<td>Systems/Link</td>
<td>FraudTec</td>
<td>Uses calling profile to detect fraud</td>
<td>NSDPF, DMH-lite</td>
</tr>
</tbody>
</table>

### Commercial Call Detail Networks

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Name</th>
<th>Comments</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTE</td>
<td>IREC</td>
<td>Routes Call Detail Records to home carrier</td>
<td>NSDPF</td>
</tr>
<tr>
<td>Securicor Wireless Networks</td>
<td>SecuriNet</td>
<td>Realtime CDR collection turnkey network development (in use within US West network)</td>
<td>IS-124</td>
</tr>
<tr>
<td>Systems/Link</td>
<td>RoamEx</td>
<td>Frame Relay Network connecting over 16 major carriers</td>
<td>NSDPF, DMH-lite</td>
</tr>
</tbody>
</table>

### IS-124 Customizable Protocol Stacks

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Name</th>
<th>Comments</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synacom</td>
<td>DMH PDE</td>
<td>TCP/IP based protocol stack with interfaces for custom applications and testing tools</td>
<td>IS-124, NSDPF</td>
</tr>
</tbody>
</table>