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Billström et al.

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[54] APPARATUSES AND MOBILE STATIONS FOR PROVIDING PACKET DATA COMMUNICATION IN DIGITAL TDMA CELLULAR SYSTEMS

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[30] Foreign Application Priority Data

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[52] U.S. Cl. 370/349; 379/60; 455/332; 370/332; 370/337; 370/338; 370/403

[58] Field of Search 370/94.1, 95.1, 370/95.3, 60, 110.1, 79; 379/58, 59-63; 455/331, 54.1, 56.1; 340/825.44

[56] References Cited

U.S. PATENT DOCUMENTS

4,887,265	12/1989	Felix	.....	370/94.1
4,916,691	4/1990	Goodman	.....	370/60
5,103,445	4/1992	Ostlund	.....	455/54.1
5,195,090	3/1993	Bolliger et al.	.....	370/94.1
5,305,308	4/1994	English et al.	.....	370/94.1
5,371,780	12/1994	Amitay	.....	370/94.1
5,384,826	1/1995	Amitay	.....	370/94.1
5,396,543	3/1995	Beeson, Jr. et al.	.....	370/94.1

FOREIGN PATENT DOCUMENTS

2063901	9/1992	Canada .
544464	6/1993	European Pat. Off. .

OTHER PUBLICATIONS

K. Felix, "Packet Switching in Digital Cellular Systems", *Pro. 38th IEEE Vehicular Technology Conf.*, pp. 414-418 (Jun. 1988).

"Cellular Digital Packet Data (CDPD) System Specification", vol. 1 System Overview, Release 1.0 (Jul. 19, 1993). P. Decker, "Packet Radio in GSM", Tech.Doc. SMG 4 58/93, European Telecommunications Standards Institute (ETSI) (Feb. 12, 1993).

P. Decker et al., "A General Packet Radio Service Proposed for GSM", Aachen University of Technology (Oct. 13, 1993).

J. Hämäläinen et al., "Packet Data over GSM Network", Tech. Doc. SMG 1 238/93, ETSI (Sep. 28, 1993). *CME 20 System Survey* Doc. No. EN/LZT 120 226 R4B, Chapter 3, pp. 17-28; Chapter 5, pp. 57-68; and Chapter 9, pp. 121-148, Ericsson Radio Systems AB (1991, 1992, 1994).

Primary Examiner—Benedict V. Safourek

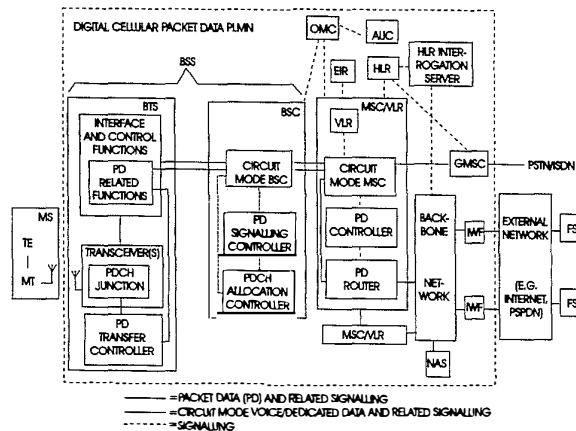
Assistant Examiner—Seema S. Rao

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[57] ABSTRACT

Apparatuses and mobile stations are described which provide packet data services in TDMA (Time Division Multiple Access) cellular systems, based on providing shared packet data channels optimized for packet data. A first "integrated" embodiment utilizes the current cellular infrastructure to the extent possible consistent with functional and performance requirements. Shared packet data channels in base stations may be provided dynamically determined by demand. A packet data controller in each Mobile services Switching Center controls access to the packet data services. A packet data router in each MSC routes packets to and from the MSC service area. A backbone network interconnects packet data routers and Interworking Functions providing internetworking with external network(s). A second "separate" embodiment, in order to minimize the impact on the current cellular system, primarily utilizes the base station portion of the cellular system, relying for the remaining network parts on a separate mobile packet data infrastructure.

57 Claims, 20 Drawing Sheets



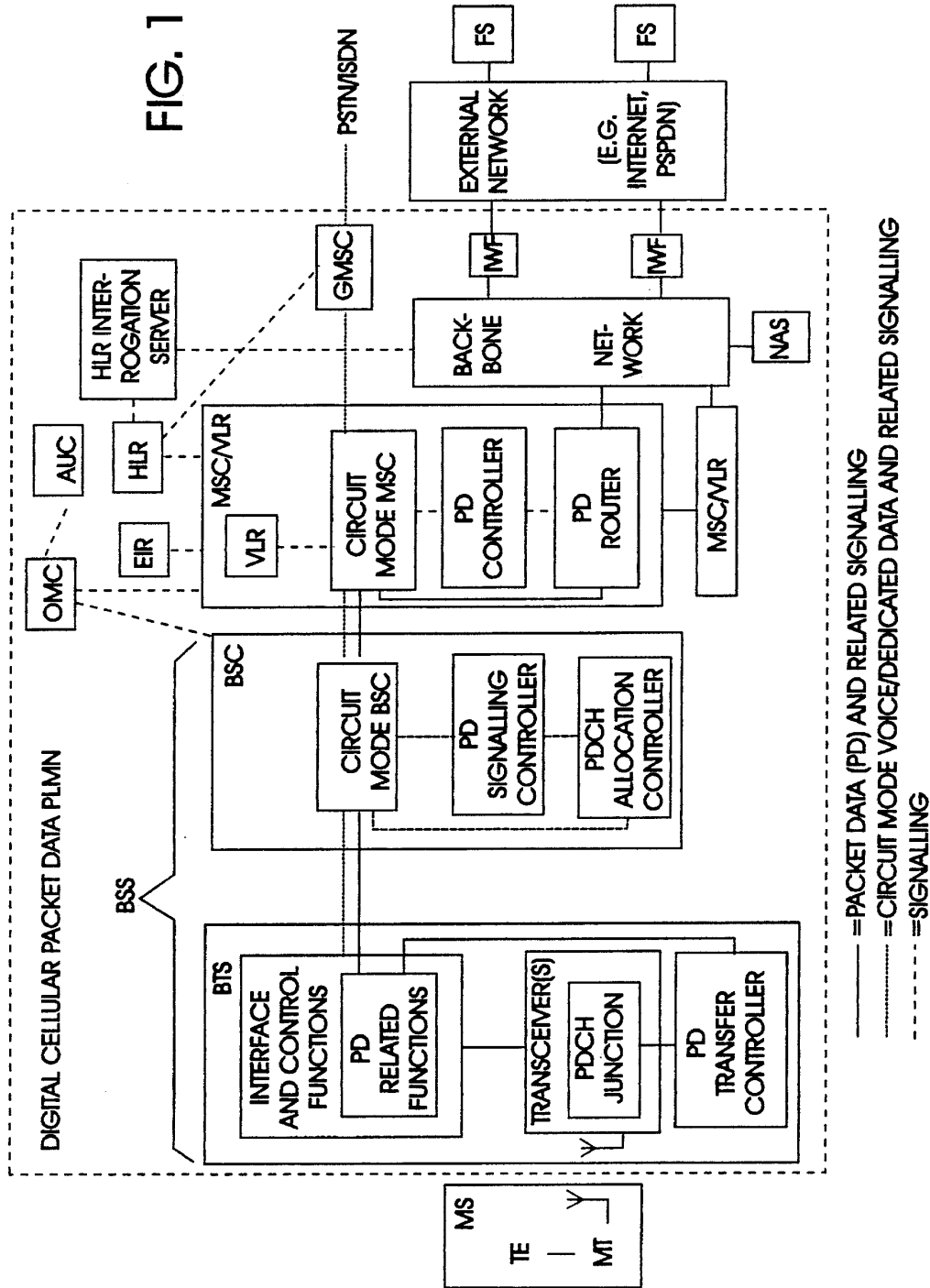


FIG. 2

INTRANETWORK PROTOCOL AND INTERWORKING EXAMPLE (IP)

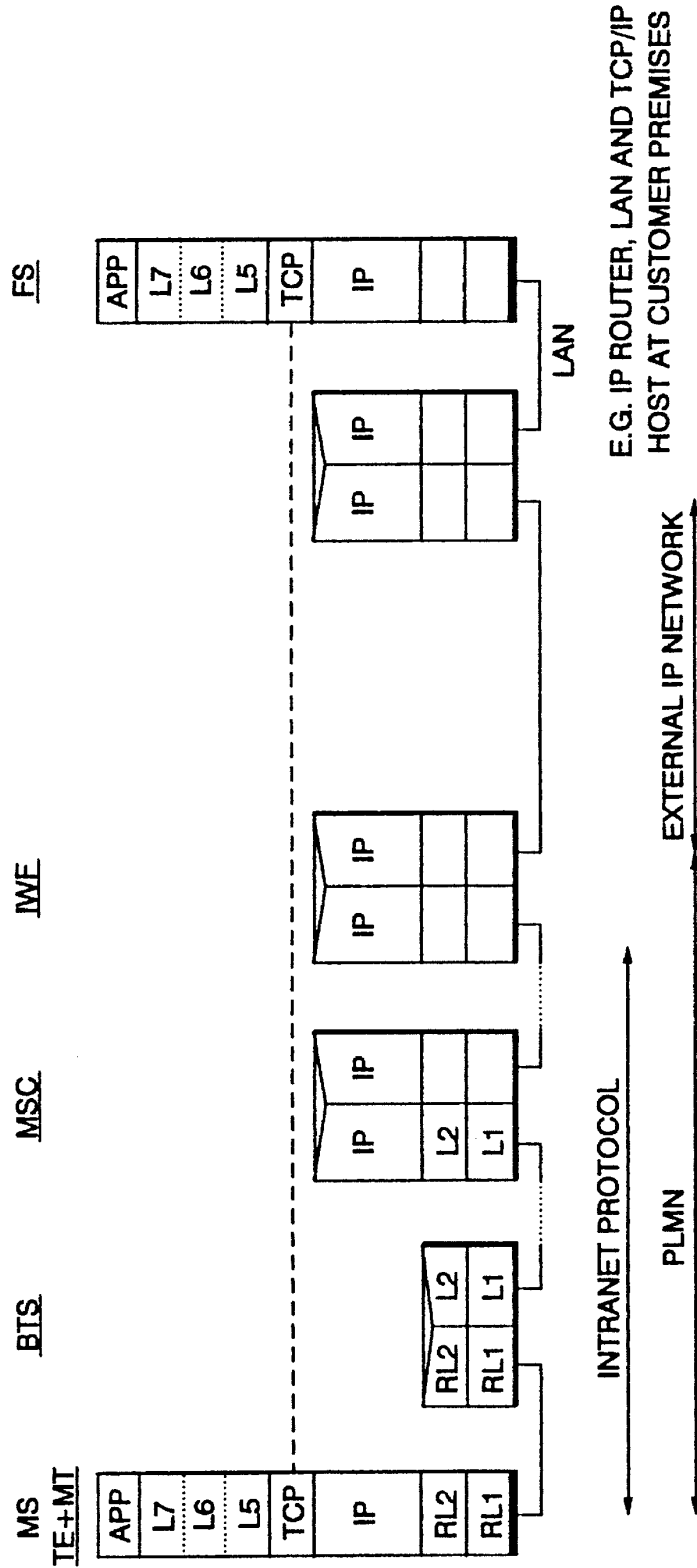


FIG. 3

INTRANETWORK PROTOCOL AND INTERWORKING EXAMPLE (X.25)

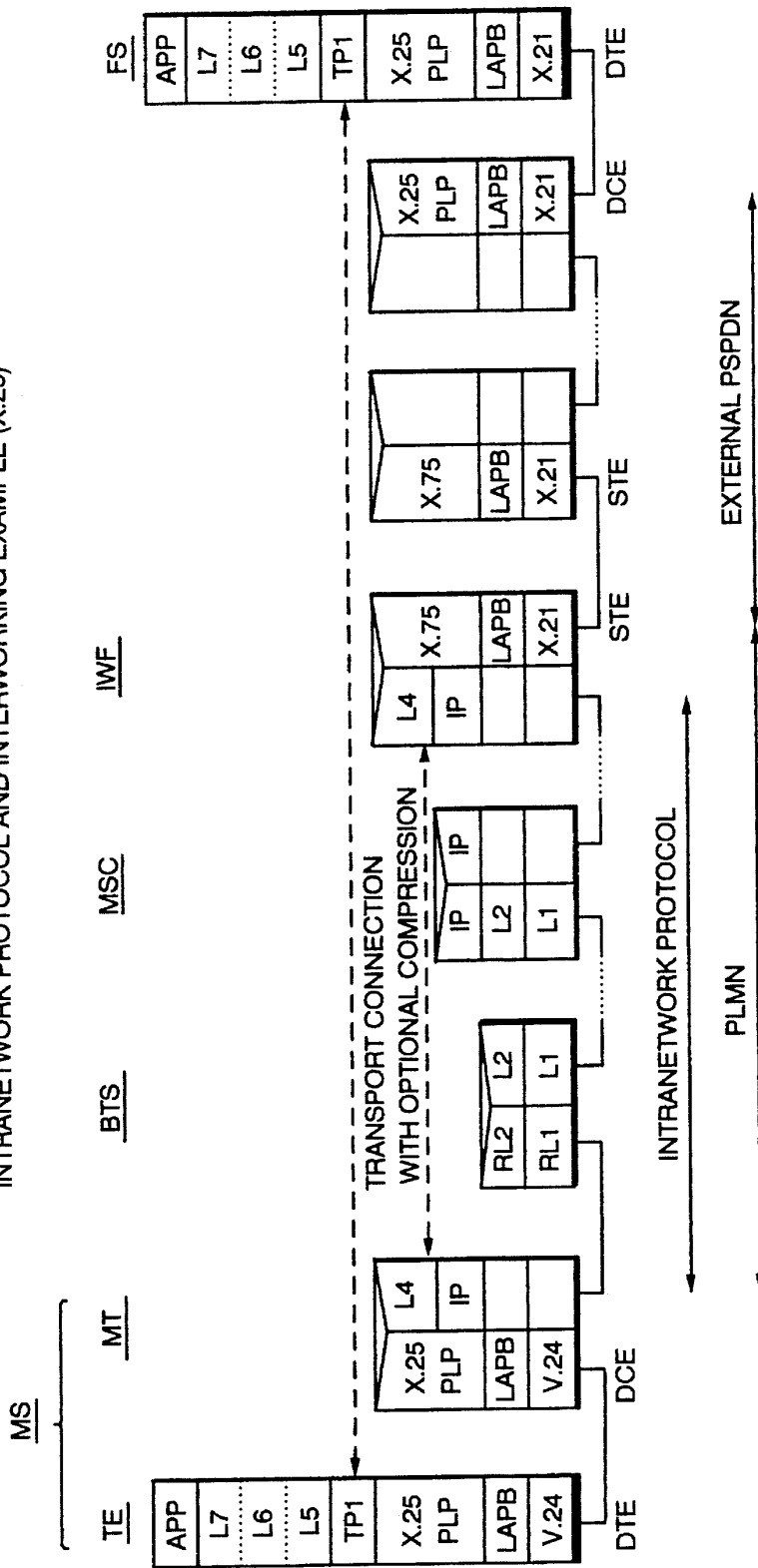
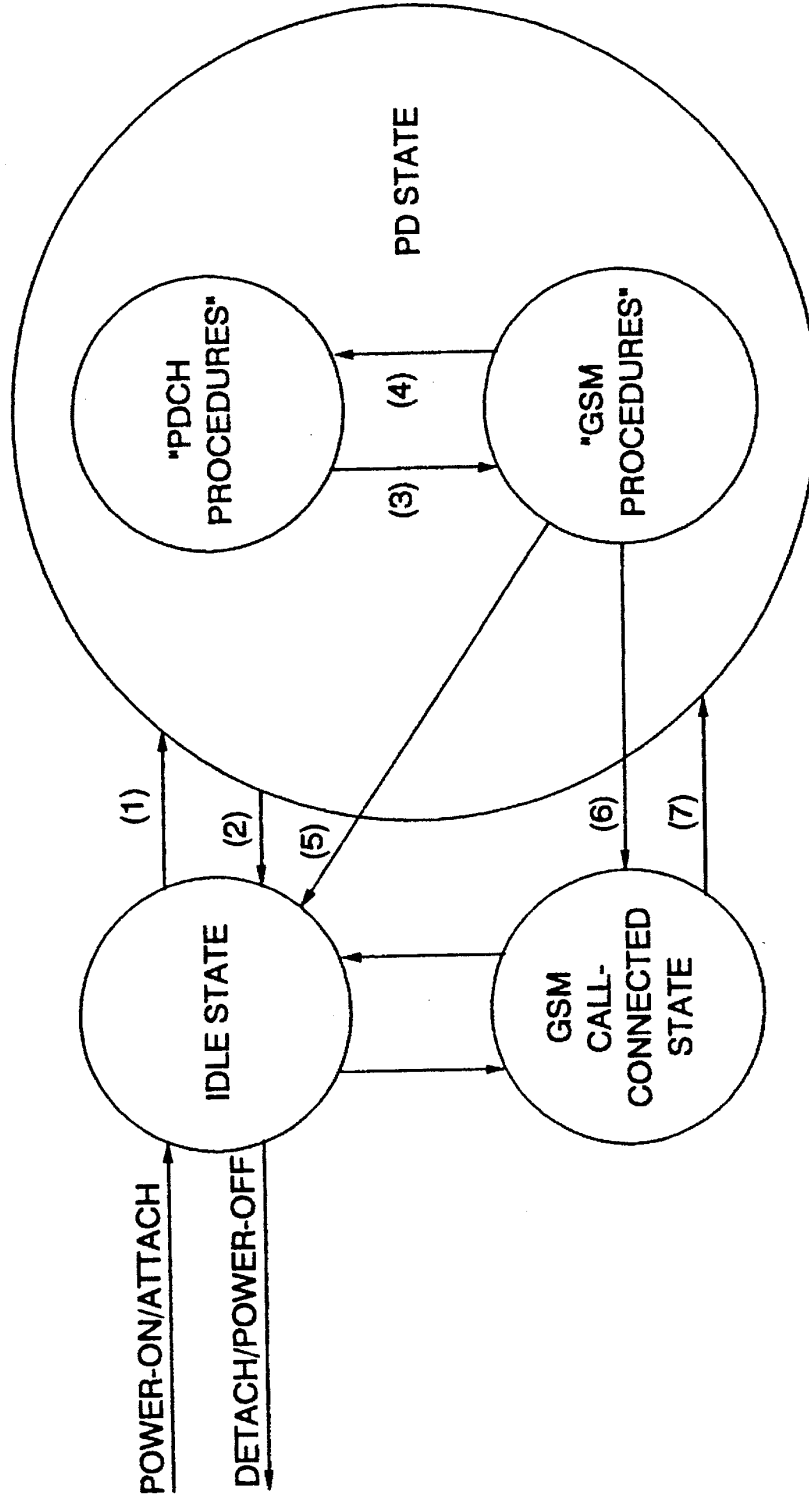


FIG. 4



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