(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
8 July 2004 (08.07.2004)

PCT

(10) International Publication Number
WO 2004/057896 A1

(51) International Patent Classification[7]: H04Q 7/38, H04L 12/56

(21) International Application Number: PCT/EP2003/014324

(22) International Filing Date: 16 December 2003 (16.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02028630.8 20 December 2002 (20.12.2002) EP

(71) Applicant (*for all designated States except US*): **MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.** [JP/JP]; 1006, Kadoma, Kadoma City, Osaka 571-8501 (JP).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **SEIDEL, Eiko** [DE/DE]; Moosbergstr. 97 a-b, 64285 Darmstadt (DE). **PETROVIC, Dragan** [YU/DE]; Am Kaiserschlag 15, 64295 Darmstadt (DE).

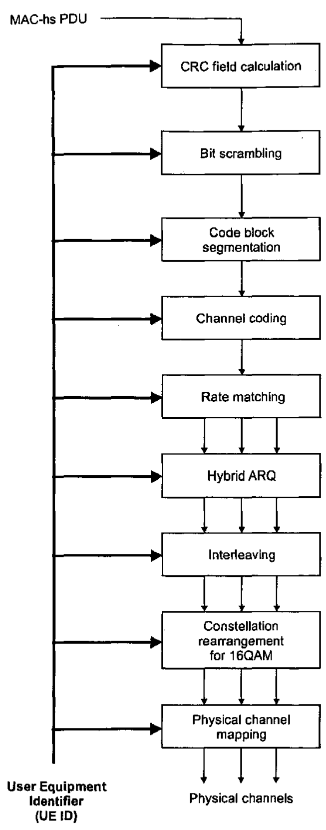
(74) Agent: **KUHL, Dietmar**; Grünecker, Kinkeldey, Stockmair & Schwanhäusser, Maximilianstrasse 58, 80538 München (DE).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),

[Continued on next page]

(54) Title: RECEIVER SPECIFIC DATA MANIPULATION IN A COMMUNICATION SYSTEM



(57) Abstract: The present invention is related to communication systems comprising transmitters and receivers in communication with one another using a control channel and a shared data channel for data transmission. To ensure secure data delivery to one or more legitimate receivers the present invention provides a transmitter which modifies the transmission data to be transmitted via said shared data channel in accordance with a receiver specific identifier, signals to said receiver via the control channel to receive said modified transmission data and transmits said modified transmission data over the shared data channel. The receiver monitors said control channel for an indication to receive transmission data which have been modified at the transmitter in accordance with a receiver specific identifier, receives said modified transmission data on said shared data channel and reconstructs said transmission data from said modified transmission data in accordance with said receiver specific identifier.

WO 2004/057896 A1

Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Receiver Specific Data Manipulation in a Communication System

The present invention is related to communication systems comprising transmitters and receivers in communication with one another using a control channel and a shared data channel for data transmission.

High Speed Downlink Packet Access (HSDPA) is a new technique that is standardized in UMTS Release 5. It shall provide higher data rates in the downlink by introducing enhancements at the air interface such as adaptive modulation and coding. HSDPA relies on Hybrid Automatic Repeat Request protocol (HARQ) Type II/III, rapid selection of users using shared channels and adaptation of transmission format parameters according to the time varying channel conditions.

The High Speed Downlink Shared Channel (HS-DSCH) is a high rate downlink transport channel for data transmission shared by several user equipments (UEs). The shared data channel (HS-DSCH) is transmitted over the entire cell or over parts of the cell using e.g. beam-forming antennas. The shared data channel is associated with one downlink Dedicated Physical Channel (DPCH) to provide functions as transmitting pilot bits and transmit power control commands. Furthermore, there are one or several shared control channels (HS-SCCH). The shared control channel is a fixed rate downlink physical channel (e.g. 60 kbps, spreading factor SF=128) used to carry downlink signaling related to shared data channel transmissions. The signaling on the control channel is used to indicate to a receiver that transmission data for the informed receiver are about to be send to it via the shared data channel. For each transmission time interval (TTI) in which data via the shared data channel are transmitted, each shared control channel carries shared data channel-related downlink signaling for one UE (e.g. used codes, modulation scheme, transport block size). Only if the control channel information is received, the UE has the information to receive, despread and decode the shared data channel.

There is a fixed time offset between the start of the shared control channel (HS-SCCH) information (indication) and the start of the corresponding shared data channel information (transmission data) as seen in Figure 14. The shared data channel is carried by the High Speed Physical Downlink Shared Channel (HS-PDSCH).

The number of control channels as seen from the UE's point-of-view can range from a minimum of one control channel to a maximum of four control channels. The UE has the capability to monitor up to four control channels simultaneously.

The control channel carries a UE identifier (e.g. in a UE-specific cyclic redundancy check field) that identifies the UE for which it is carrying the information necessary for decoding the HS-PDSCH. The UE identifies the control channel carrying information for it by de-scrambling the first part of the control channel by the UE identity. This part contains the canalization code set and the modulation scheme for the shared data channel allocation with the second part containing the transport block size and Hybrid ARQ related information (Hybrid-ARQ process information, Redundancy and Constellation version). One cyclic redundancy check (CRC) is calculated over both parts and attached to the control channel information. The UE identifier (UE ID) is similar to the shared data channel Radio Network Temporary Identity (HS-RNTI). The term UE ID is used on the physical layer PHY, while the term HS-RNTI is used in the radio resource control RRC layer. This identifiers uniquely identify a UE within the cell.

In Figure 15 it is shown how different MAC-d SDUs are concatenated to form a data transmitted via the physical channels. The transmitted data are secured by a CRC field. Besides the shared control channel signaling carried on the control channel there is in-band signaling on shared data channel within the Medium Access Control header (MAC-hs header) of MAC-hs protocol data unit (PDU). These parameters are for instance signaled to support to identify the reordering queue (by means of a priority class identifier) and to provide in-sequence delivery (by means of transmission sequence numbers) at the UE. These parameters are protected by the same physical layer CRC as the PDU Data block.

Figure 16 shows the encoding chain used to encode the data transmitted via the shared control channel as an allocation message. As shown in the Figure, information such as a channelization-code-set x_{ccs}, modulation scheme information x_{ms}, transport-block size information x_{tbs}, Hybrid-ARQ process information x_{hap}, redundancy and constellation version information x_{rv}, a new data indicator x_{nd} and a receiver specific identifier, i.e. a user equipment identity x_{ue} is transmitted in the control channel information indicating to a receiver to receive data on the shared data channel. These parameters are needed by the receiver to successfully receive and reconstruct the data directed to it on the shared data channel. Figure 16 shows how these parameters are multiplexed, coded and mapped to the shared control channel. The realization of these functions are described in the following:

The 16 bit UE identity is mapped such that $x_{ue,1}$ corresponds to the Most Significant Bit and $x_{ue,16}$ to the Least Significant Bit. The channelization-code-set information $x_{ccs,1}$, $x_{ccs,2}$, …, $x_{ccs,7}$ and modulation-scheme information $x_{m,1}$ are multiplexed together. This gives a sequence of bits $x_{1,1}$, $x_{1,2}$, …, $x_{1,8}$ where

$$x_{1,i} = x_{ccs,i} \qquad i=1,2,\ldots,7$$

$$x_{1,i} = x_{ms,i-7} \qquad i=8$$

The transport-block-size information $x_{tbs,1}$, $x_{tbs,2}$, …, $x_{tbs,6}$, Hybrid-ARQ-process information $x_{hap,1}$,$x_{hap,2}$, $x_{hap,3}$, redundancy version information $x_{rv,1}$, $x_{rv,2}$, $x_{rv,3}$ and the new data indicator $x_{nd,1}$ are multiplexed together. This gives a sequence of bits $x_{2,1}$, $x_{2,2}$, …, $x_{2,13}$ where

$$x_{2,i} = x_{tbs,i} \qquad i=1,2,\ldots,6$$

$$x_{2,i} = x_{hap,i-6} \qquad i=7,8,9$$

$$x_{2,i} = x_{rv,i-9} \qquad i=10,11,12$$

$$x_{2,i} = x_{nd,i-12} \qquad i=13$$

From the sequence of bits $x_{1,1}$, $x_{1,2}$, …, $x_{1,8}$, $x_{2,1}$, $x_{2,2}$, …, $x_{2,13}$ a 16 bits CRC attachment for shared control channel is calculated.

The calculation of the CRC field gives a sequence of bits c_1, c_2, …, c_{16}. This sequence of bits is then masked with the UE Identity $x_{ue,1}$, $x_{ue,2}$, …, $x_{ue,16}$ and then appended to the sequence of bits $x_{2,1}$, $x_{2,2}$, …, $x_{2,13}$ to form the sequence of bits y_1, y_2, …, y_{29}, where

$$y_i = x_{2,i} \qquad i=1,2,\ldots,13$$

$$y_i = (c_{i-13} + x_{ue,i-13}) \bmod 2 \qquad i=14,15,\ldots,29$$

Rate 1/3 convolutional coding, is applied to the sequence of bits $x_{1,1}$,$x_{1,2}$, …,$x_{1,8}$. This gives a sequence of bits $z_{1,1}$, $z_{1,2}$, …, $z_{1,48}$. Further, rate 1/3 convolutional coding, is applied to the sequence of bits y_1, y_2, …, y_{29}. This gives a sequence of bits $z_{2,1}$, $z_{2,2}$, …, $z_{2,111}$.

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.

WHAT WILL YOU BUILD? | **sales@docketalarm.com** | **1-866-77-FASTCASE**

fastcase® Smarter legal research.