

**METHOD OF OPTIMIZING DATA COMMUNICATION
DEVICES' AUTO-ON FUNCTIONALITY**

TECHNICAL FIELD

5 This invention relates generally to a method that optimizes data communication devices' auto on functionality. More particularly, the invention provides a method to be practiced at data devices to smooth network data traffic when a plurality of data devices with auto-on functionality are turned on at the same time.

 The data devices referred herein include but not limited to Personal Digital
10 Assistants, mobile communication devices, cellular phones, computers and other two-way communication devices with auto-on/auto-off functionality built in.

BACKGROUND ART

 When a data device is auto-on, it initially registers with the data server. Upon
15 receiving the registration, the data server knows that the data device is active and it is ready for service. The data server will start sending accumulated data traffic to the data device via the data network. When a data device is auto-off, it de-registers with the push data server. The data server usually accumulates the data traffic for the data device during its auto-off period.

20 Statistics show that a majority of data device users, when using the auto-on functionality, intend to have their devices auto-on within a roughly very short period of time. One peak period for wireless email devices, for example, is at 8:00am. This is the time when users wake up and want to check their emails received overnight. Another example peak period for wireless stock quotation devices is at 6:00am. This is the time when stock analysts
25 wake up and check the overseas stock market overnight performance.

 Turning on a plurality of data devices at the same time sometimes puts significant traffic on the wireless network and even occasionally brings down the network. One method used to alleviate the impact to the wireless data network when auto-on is used is to keep the

devices' transceiver on during the auto-off period so that all the traffic such as emails can still be exchanged and spread between the devices and the data servers even during the auto-off period. In this case, when the devices are turned on automatically (auto-on), the emails are already available on the devices. The side effect of this solution is that the battery
5 life on the devices is consumed by keeping the transceivers on even though the users do not need the data information during the device auto-off period.

DISCLOSURE OF INVENTION

Before a data device automatically turns on (auto-on), its transceiver is turned on
10 first. The interval between its transceiver on and the device auto-on is randomized to reduce the probability of synchronization with the transceivers on other devices in the same network.

An alternate embodiment of the invention is that when a device is auto-on, it does not register with the data server immediately. Instead it waits for period of time. The interval
15 between auto-on and the time that the device registers the data server is also randomized to reduce the probability of synchronization with other devices on the same network. This alternate embodiment is suggested to be used for non-time critical information retrieval devices.

A further alternative embodiment of the invention is when a device is auto-on, it does
20 not immediately turn on its receiver. Instead it waits for a period of time. The interval between auto-on and the time that receiver is turned on and registers with the data server is also randomized to reduce the probability of synchronization with other devices on the same network. This alternate embodiment is suggested to be used for non-time critical information retrieval devices.

25 The present invention therefore provides a method, in a network comprising data devices having transmitters and receivers, of temporally spreading network traffic associated with auto-on functionality of said data devices comprising the steps of: activating receivers of

said data devices prior to auto-on of said data devices in an unsynchronized manner; and receiving information on said receivers of said data devices prior to said auto-on of said data devices.

The present invention further provides a method, in a network comprising data
5 devices having transmitters and receivers, of temporally spreading network traffic associated with auto-on functionality of said data devices comprising the steps of: activating receivers of said data devices after an auto-on of said data devices in an unsynchronized manner; and receiving information on said receivers of said data devices after said activating step.

The present invention still further provides a method, in a network comprising data
10 devices having transmitters and receivers, of temporally spreading network traffic associated with auto-on functionality of said data devices comprising the steps of: registering with a data server in said network after an auto-on of said data devices in an unsynchronized manner; and receiving information from said data server after said registering step.

The present invention further provides a data device having an auto-on function that
15 temporally spreads network traffic associated with said auto-on function, said data device comprising: a transmitter and receiver for communicating with a network; a battery to power said data device; a storage subsystem; and a microprocessor interacting with said storage subsystem and said transmitter and receiver, said microprocessor including a timer for activating said receiver prior to or after activation of said auto-on function, wherein said timer
20 is set for a variable duration and said receiver is activated at the expiration of said timer to temporally spread network traffic.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a block diagram of an exemplary wireless data device for use in an
25 embodiment of the current invention;

Fig. 2 is a state transition diagram in accordance with an embodiment current invention;

Fig. 3 is a state transition diagram in accordance with an alternate embodiment current invention;

The same reference numerals are used in different figures to denote similar elements.

BEST MODE FOR CARRYING OUT THE INVENTION

Fig. 1 is a block diagram of an exemplary wireless data device for use in an embodiment of the current invention. The wireless data device **10** is preferably a two-way communication device having at least data communication capabilities. Where the device **10** is enabled for two-way communications, the device will incorporate a processor **102**, a storage subsystem **104**, a transceiver subsystem **106**, a user interface mode **108** and battery **110**. The microprocessor **102** controls the overall operation of the data device. Communication functions, including signaling and data communications between data device **10** and network **20** as well as between data device **10** and data server **50**, are performed through the transceiver subsystem **106**. The microprocessor **102** also interacts with further device subsystems such as the storage subsystem **104** and the user interface mode **108**. Users may read or compose email messages for instance through the user interface module **108**; receive or send email messages via transceiver **106**. Battery **110** is used to power wireless device **10**.

A predetermined set of applications that control basic device operations, including at least data communication applications for example, will normally be installed on the device **10** during manufacture. A set of applications that may be loaded onto the device includes, but is not limited to e-mail, calendar events, appointments, browser and task items. Such applications would have the ability to perform data communications.

Fig. 2 is a state transition diagram in accordance with an embodiment current invention. There are three states associated with each data device **10** – Active State **210**, Dormant State **220** and Snooze State **230**. When an auto-off **240** is triggered at data device

10, the auto-on timer and the receiver-on timer will be started at data device **10**, after which data device **10** does a transition from Active State **210** to Dormant State **220**. The receiver-on timer value of data device **10** is chosen in a way that the probability of synchronization with the receiver-on from other devices on the same network is minimized.

5 As will be appreciated by one skilled in the art, auto-on timer and receiver-on timer may be countdown timers or may be comparators that expire upon reaching a predetermined time as measured by a local clock on said data device **10**.

When the receiver-on timer expires, data device **10** does a receiver on **250** and moves to Snooze State **230**. Data device **10** starts communicating with network **20** and data
10 server **50** at state **230** and information is exchanged. However, data device **10** may still appear inactive to the user. For instance, the user interface **108** may continue to be off or not updated; there are no alerts of arrival new emails, calendar events, or the like. Those skilled in art understand that the main purpose of Snooze State **230** is the spreading of data traffic for data devices **10** over time on the network **20**.

15 Eventually auto-on **260** is triggered and data device **10** moves from Snooze State **230** to Active State **210**. In Active State **210** a user may read or browse the information he already received at Snooze State **230**. He may also continue to exchange information with network **20** and data server **50**.

The state transition may also be interrupted. As illustrated in Fig. 2, when data device
20 **10** is in Dormant State **220**, the user may force data device **10** to come out of Dormant State **220** and transition into Active State **210** by an auto off termination **270**. In this case, Snooze State **230** is bypassed. The receiver-on timer and the auto-on timer are cancelled if auto off termination **270** is used.

Reference is now made to Figure 3. In an alternate embodiment, the transition
25 between Dormant State **220** and Snooze State **230** can also be triggered by auto-on **260** and in turn receiver on **250** triggers a transition between Snooze State **230** and Active State **210**.

Fig. 3 is a state transition diagram in accordance with an alternate embodiment current invention. In Snooze State **230**, data device **10** is prohibited from registering with the data server **50** immediately. Instead, a back-off timer is started. The back-off timer value of data device **10** is chosen in a way that the probability of synchronization with the back-off
5 from other devices on the same network is minimized. As with the auto-on timer and receiver-on timer, the back-off timer may be a countdown timer or comparator to a local clock on the data device **10**.

When the back-off expires, data device **10** does a receiver on **250** and transits to Active State **210**. Data device **10** starts communicating with network **20** and data server **50**
10 at Active State **210** and information is exchanged.

As in Fig. 2, the state transition can also be interrupted by auto off termination **270**. In this case, both the back-off timer and the auto-on timer are cancelled.

The embodiments described herein are examples of structures, systems or methods having elements corresponding to elements of the invention. This written description may
15 enable those skilled in the art to make and use embodiments having alternative elements that likewise correspond to the elements of the invention. The intended scope of the invention thus includes other structures, systems or methods that do not differ from the invention as described herein, and further includes other structures, systems or methods with insubstantial differences from the invention as described herein.

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CLAIMS:

1. In a network comprising data devices having transmitters and receivers, a method of temporally spreading network traffic associated with auto-on functionality of said data
5 devices comprising the steps of:

activating receivers of said data devices prior to auto-on of said data devices in an unsynchronized manner; and

receiving information on said receivers of said data devices prior to said auto-on of said data devices.

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2. The method of claim 1, wherein said activating step includes setting a receiver-on timer on said data devices when said data devices are placed in a dormant state.

3. The method of claim 2, wherein said data devices are placed in a dormant state
15 based on an auto off functionality on said data devices.

4. The method of claim 2, wherein forcing said data devices into an active state cancels said step of setting said receiver-on timer.

20 5. The method of claim 1, wherein user interfaces on said data devices are not updated prior to auto-on of said data devices.

6. The method of claim 1, wherein alerts from said data devices are not signaled to users prior to auto-on of said data devices.

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7. In a network comprising data devices having transmitters and receivers, a method of temporally spreading network traffic associated with auto-on functionality of said data devices comprising the steps of:

activating receivers of said data devices after an auto-on of said data devices in an unsynchronized manner; and

receiving information on said receivers of said data devices after said activating step.

5 8. The method of claim 7, further comprising the step of setting a back-off timer on said data devices after an auto-on of said data devices and prior to said activating step, said activating step commencing at an expiry of said back-off timer.

9. The method of claim 7 further comprising the step of optionally terminating a dormant
10 state on said data devices, whereby if said dormant state on said data devices is terminated, said receivers are activated immediately and said data devices move into an active state.

10. In a network comprising data devices having transmitters and receivers, a method of temporally spreading network traffic associated with auto-on functionality of said data
15 devices comprising the steps of:

registering with a data server in said network after an auto-on of said data devices in an unsynchronized manner; and

receiving information from said data server after said registering step.

20 11. The method of claim 10, further comprising the step of setting a back-off timer on said data devices after an auto-on of said data devices and prior to said activating step, said registering step commencing at an expiry of said back-off timer.

12. The method of claim 10 further comprising the step of optionally terminating a
25 dormant state on said data devices, whereby if said dormant state on said data devices is terminated, said data devices are registered immediately and said data devices move into an active state.

13. A data device having an auto-on function that temporally spreads network traffic associated with said auto-on function, said data device comprising:

a transmitter and receiver for communicating with a network;

a battery to power said data device;

5 a storage subsystem; and

a microprocessor interacting with said storage subsystem and said transmitter and receiver, said microprocessor including a timer for activating said receiver prior to or after activation of said auto-on function,

wherein said timer is set for a variable duration and said receiver is activated at the
10 expiration of said timer to temporally spread network traffic.