

BRIEF SUMMARY

[0004] A blow-out preventer (BOP) may be improved by having a subsea processing unit located underwater with the blow-out preventer. The processing unit may enable the blow-out preventer to function as a blow-out arrestor (BOA), because the processing unit may determine problem conditions exist that warrant taking action within the blow-out preventer to prevent and/or arrest a possible blow-out condition.

[0005] There is disclosed an apparatus may include an underwater drilling component, in which the underwater drilling component may include a physical receptor configured to receive a first processor unit, an inductive power device configured to transfer power to the first processor unit through the physical receptor, and a wireless communications system configured to communicate with the first processor unit through the physical receptor.

[0006] There is also disclosed an apparatus may include a processor; an inductive power device coupled to the processor and configured to receive power for the processor; and a wireless communications system coupled to the processor and configured to communicate with an underwater drilling component.

[0007] There is also disclosed a method of controlling an underwater drilling component may include receiving power, at a subsea processor, through an inductive coupling with the underwater drilling component, and communicating wirelessly, from the subsea processor, with the underwater drilling component to control the underwater drilling component.

[0008] According to a first aspect, an apparatus may include at least one actuatable subsea component of an underwater drilling tool; and at least ~~one~~ two subsea processors configured to execute two or more applications, each of the subsea processors configured to: wirelessly communicate with the at least one subsea component; and execute at least one of the applications that is distinct from each of the applications that each other of the subsea processors is configured to execute; in which ~~where the at least one subsea component and the at least one two subsea processors are configured to communicate with the at least one subsea component according to a time division multiple access (TDMA) scheme.~~

[0009] According to a second aspect, a system may include at least one actuatable subsea component of an underwater drilling tool; at least two subsea processors, each configured to communicate with the at least one subsea component; and a subsea network including a shared communications bus between the at least one subsea component and the at least two subsea processors ~~comprising a subsea network, in which~~ where the at least two subsea processors are configured to communicate with the at least one subsea component on the shared communications bus according to a time division multiple access (TDMA) scheme.

[0010] According to a third aspect, a method may include receiving ~~data~~, at a first subsea processor, ~~from data captured by a sensor of an actuatable subsea component of an underwater drilling tool; processing the received data, at the subsea processor, to determine~~ identify a command ~~to control for actuating the subsea component; and transmitting, with a second subsea processor, the command, from the subsea processor, to the subsea component through a shared communications bus that is shared by the first and second subsea processors, the transmitting according to a time division multiple access (TDMA) scheme in a subsea network; where the processing is performed by at least one of the first and second processors.~~

[0011] The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter that form the subject of the claims of the invention. It should be appreciated by those skilled in the art that the conception and specific embodiment disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims. The novel features that are believed to be characteristic of the invention, both as to its organization and method of operation, together with further objects and advantages will be better understood from the following description when considered in connection with the accompanying figures. It is to be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended as a definition of the limits of the present invention.

CLAIMS

What is claimed is:

1. An apparatus, comprising:
 - at least one actuatable subsea component of an underwater drilling tool;
 - at least ~~one~~ two subsea processors configured to execute two or more applications, each of the subsea processors configured to:
 - wirelessly communicate with the at least one subsea component; and
 - execute at least one of the applications that is distinct from each of the applications that each other of the subsea processors is configured to execute;
 - ~~in which where the at least one subsea component and the~~ at least ~~one~~ two subsea processors are configured to communicate with the at least one subsea component according to a time division multiple access (TDMA) scheme.
2. The apparatus of claim 1, in which the at least one subsea component comprises at least one of a solenoid, ~~a sensor,~~ a ram blow out preventer, a ~~shearing tool~~ shear ram blow out preventer, an annular blowout preventer, and a flow valve.
3. The apparatus of claim 1, in which the underwater drilling tool comprises at least one of a blow out preventer (BOP) stack and a ~~blow out arrestor (BOA)~~ lower marine riser package.
4. The apparatus of claim 1, in which ~~the~~ at least one of the at least two subsea processors and the at least one subsea component are configured to communicate through at least one of Wi-Fi or radio frequency (RF).

5. The apparatus of claim 1, in which ~~the~~ at least one of the at least two subsea processors is configured to actuate the at least one subsea component ~~take an action~~ in response to data received from a sensor of the at least one subsea component.
6. The apparatus of claim 5, in which ~~the~~ at least one of the at least two subsea processors is configured to actuate the at least one subsea component ~~select the action~~ based on a model of the at least one subsea component ~~underwater drilling tool~~.

7. The apparatus of claim 1, in which ~~the~~ at least one of the at least two subsea processors is further configured to communicate with at least one of an onshore network and an offshore network through a bridge.
8. The apparatus of claim 1, in which ~~the~~ at least one of the at least two subsea processors is further configured to receive a clock signal for synchronizing the TDMA scheme.
9. A system, comprising:
 - at least one actuatable subsea component of an underwater drilling tool;
 - at least two subsea processors, each configured to communicate with the at least one subsea component; and
 - a subsea network including a shared communications bus between the at least one subsea component and the at least two subsea processors comprising a subsea network;
 - ~~in which~~where the at least two subsea processors are configured to communicate with the at least one subsea component on the shared communications bus according to a time division multiple access (TDMA) scheme.
10. The system of claim 9, ~~in which~~where:
 - the at least two subsea processors are configured to execute two ~~different or more~~ applications; and
 - each of the subsea processors is configured to execute at least one of the applications that is distinct from each of the applications that each other of the subsea processors is configured to execute.

11. The system of claim 9, further comprising a second communications bus ~~coupling between~~ the shared communications bus ~~to and~~ an offshore network.
12. The system of claim 11, in which at least one of the at least two subsea processors ~~are~~ is configured to ~~control~~ actuate the ~~underwater drilling tools~~ subsea component according to one or more commands received through the second communications bus.

13. The system of claim 11, in which at least one of the at least two subsea processors are-is configured to monitor-receive data from a sensor of the underwater drilling tool at least one subsea component and transfer communicate a signal indicative of the data to-through the second communications bus.
14. The system of claim 11, in which the second communications bus is configured to provide-communicate a power signal to the at least two subsea processors to provide power to the at least two subsea processors.
15. The system of claim 14, further comprising a transformer configured to decrease a voltage of a the power signal transferred over the second communications bus.
16. The system of claim 9, in which the at least one subsea component comprises at least one of a solenoid, a sensor, a ram blow out preventer, a shearing tool shear ram blow out preventer, an annular blow out preventer, and a flow valve.
17. The system of claim 9, in which the underwater drilling tool comprises at least one of a blow out preventer (BOP) stack and a blow-out-arrestor (BOA) lower marine riser package.
18. A method, comprising:

receiving ~~data~~, at a first subsea processor, data captured by a sensor of an actuatable ~~from a subsea component of an underwater drilling tool~~;

processing the received data, ~~at the subsea processor~~, to ~~determine~~ identify a command to control for actuating the subsea component; and

~~transmitting, with a second subsea processor, the command, from the subsea processor, to the subsea component through a shared communications bus that is shared by the first and second subsea processors, the transmitting according to a time division multiple access (TDMA) scheme in a subsea network;~~

where the processing is performed by at least one of the first and second processors.

19. The method of claim 18, further comprising ~~transmitting, with at least one of the first and second subsea processors, a signal indicative of the received data, from the subsea processor, to an offshore network from the subsea network over~~through a second shared communications bus that is shared by the first and second subsea processors and according to the TDMA scheme.

20. The method of claim 19, further comprising receiving, through the second communications bus, power, at for at least one of the first and second the
subsea processors, from the offshore network through the second shared
communications bus.