HART PROTOCOL

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INTRODUCTION

- Highway Addressable Remote Transducer
- Bidirectional
- Digital Signal to Analog Signal

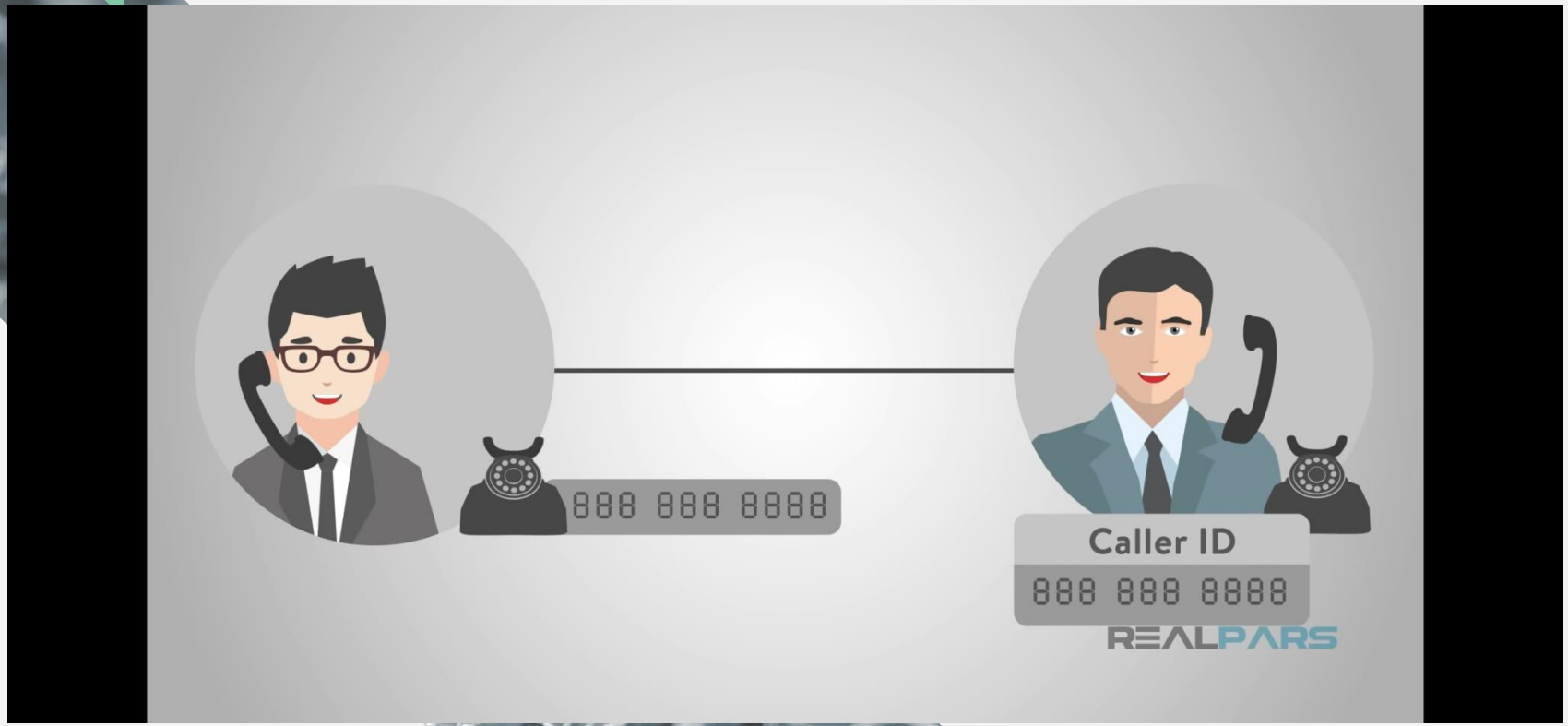
HART PROTOCOL ARCHITECTURE

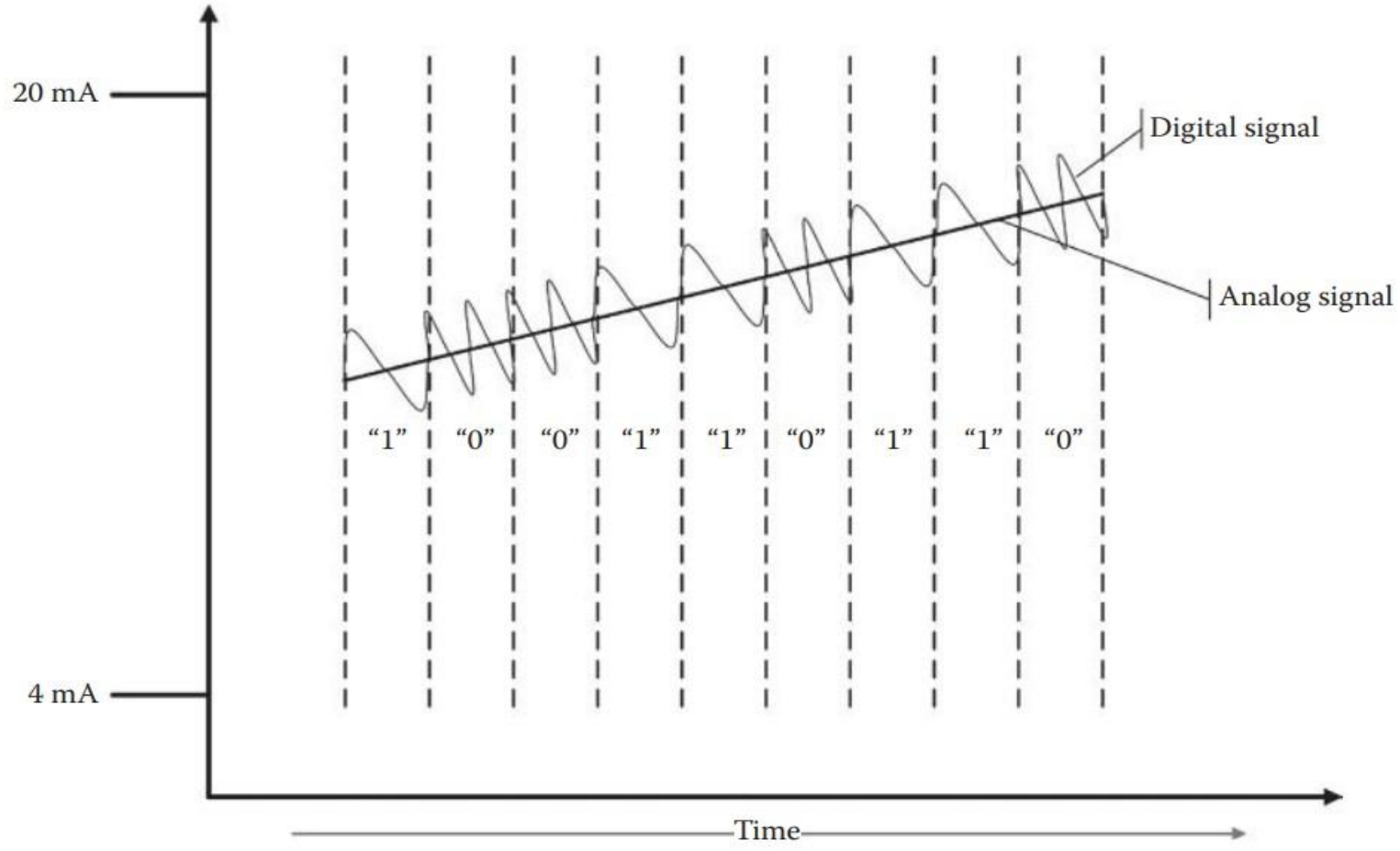
- Master Device
- Slave Device
- Communication Mods
- Analog 4-20mA Current Loop
- Hart Modem

HART PROTOCOL CONFIGURATION

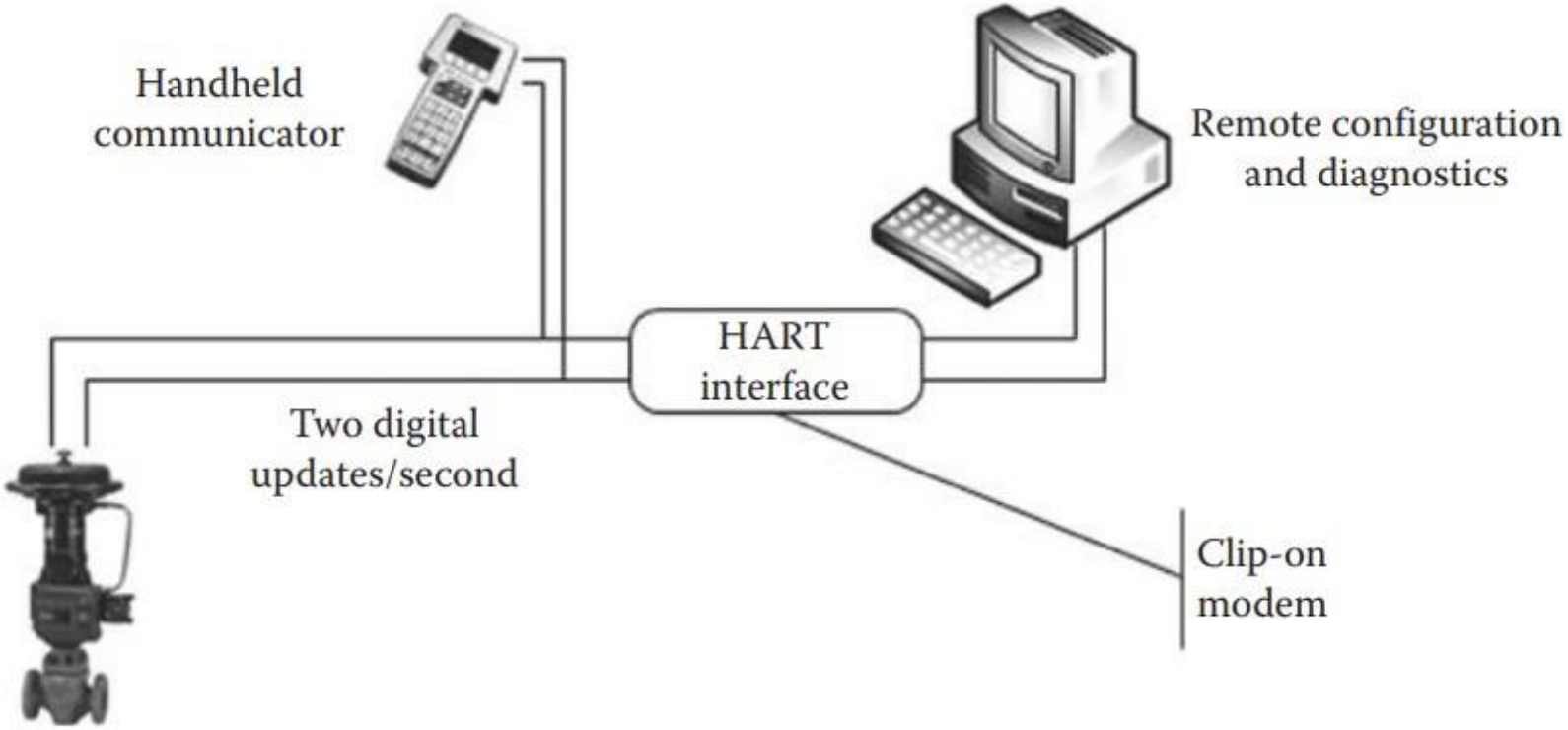
- Point to Point configuration
- Multidrop Configuration

Analog communication device




20 mA
4 mA
Digital signal
Analog signal
"1"
"0"
"0"
"1"
"1"
"0"
"1"
"1"
"0"
Time

HART System


Handheld
communicator
Remote configuration
and diagnostics
HART
interface
Two digital
updates/second
Clip-on
modem

The purpose of using frequency modulation over analog signals

- Bi-directional communication
- Compatibility
- Flexibility and expandability

Hart Protocol Comparison

Interface	Data rate	Range	Medium	Application
Ethernet	100 Mb/s, 1 and 10 Gb/s	100 m	Shielded or unshielded twisted pair; fiber cable option	Connecting field buses to existing business networks or the Internet
Foundation Field Bus	H1: 31.5 kb/s, HSE: 100 Mb/s, 1 Gb/s	1900 m max.	Shielded or unshielded twisted pair	Connect sensors, actuators, etc., in process control
Highway-Addressable Remote Transducer (HART)	1200 and 3600 b/s	< 10,000 ft..	Shielded twisted pair	Analog and digital sensor and actuator connections in process control
Modbus	9.6 & 19.2 kb/s	< 1000 ft.	Shielded or unshielded twisted pair	Monitor and control with PLCs
Profibus	9.6 and 31.25 kb/s, to 12 Mb/s	1200 m	Shielded or unshielded twisted pair	Monitor and control in process automation
RS-232	1.2 to 115.2 kb/s	< 50 ft..	Multiwire cable	Connections to PC peripheral and industrial devices
RS-485	100 kb/s to 10 Mb/s	40 to 4000 ft.	Shielded or unshielded twisted pair	Industrial and commercial networks

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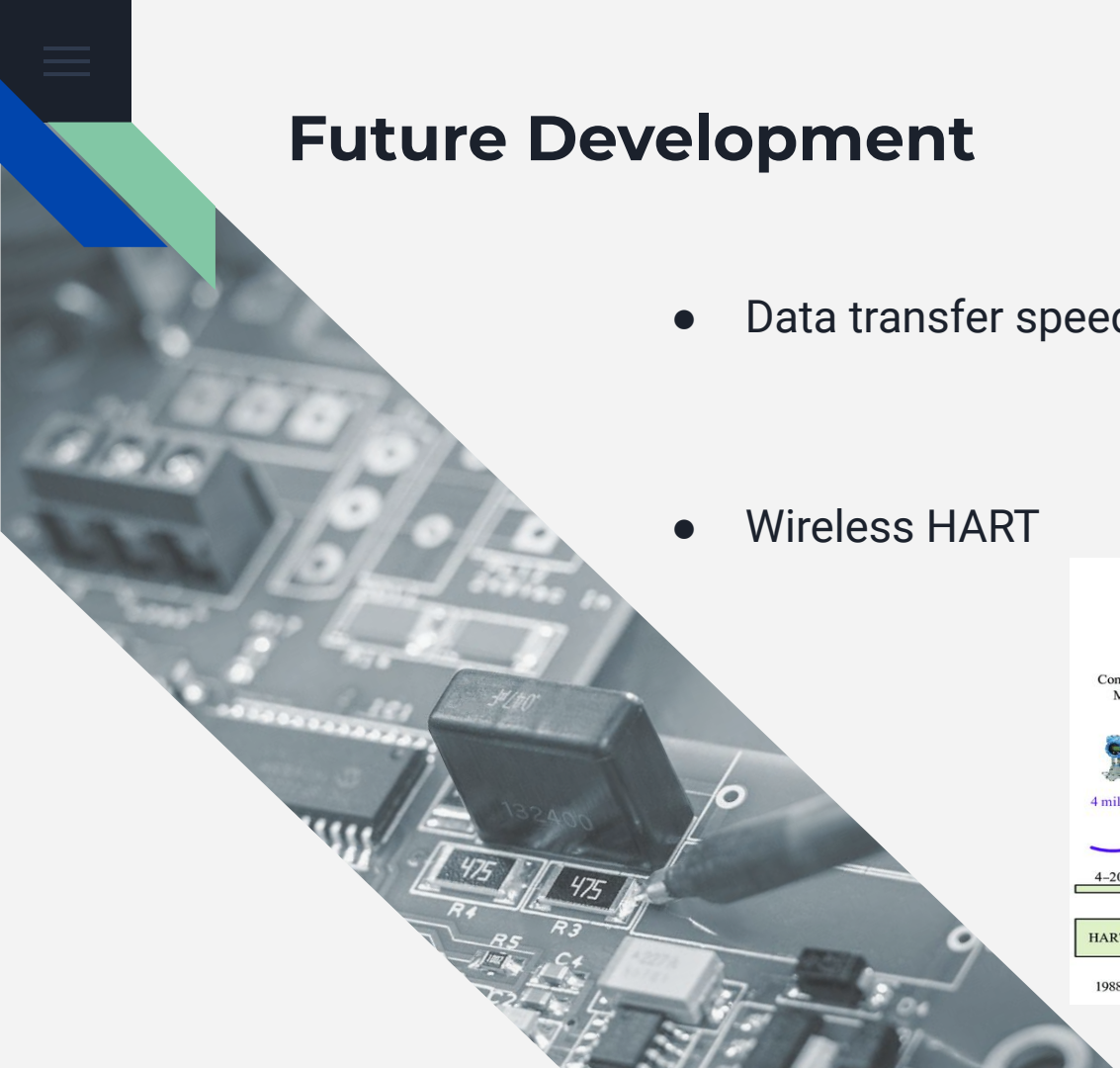
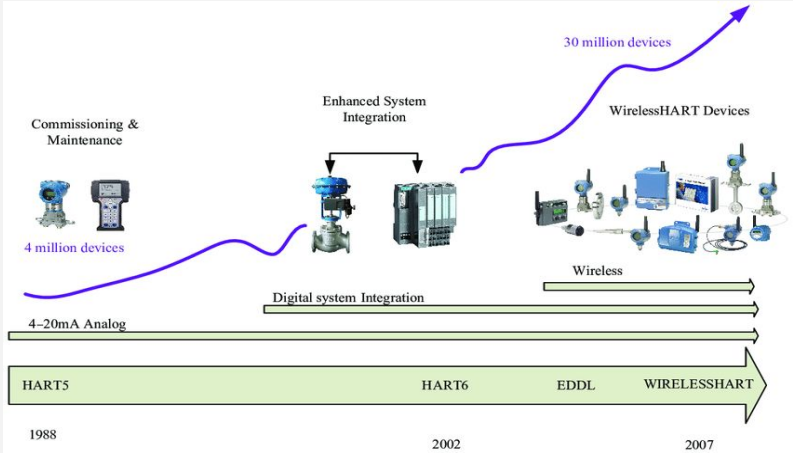
Hart Protocol Applications

- Device configuration and calibration
- Asset management
- Device monitoring and troubleshooting
- Safety instrumented systems
- Process control
- Inventory management

Future Development



- Data transfer speed and capacity
- Wireless HART



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Summary

The HART (Highway Addressable Remote Transducer) protocol is a widely used communication standard in the field of process automation. It allows for bidirectional digital communication between smart devices and control systems, while maintaining compatibility with traditional analog devices. HART combines analog and digital signals over a single wire, enabling remote configuration, monitoring, and diagnostics of devices such as sensors and actuators. This protocol has proven to be a cost-effective solution for enhancing the functionality and efficiency of industrial processes, making it a valuable tool in various industries including oil and gas, chemical, and manufacturing.

Reference

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and Applications By Giorgio C Buttazzo 2013.

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[4]https://www.researchgate.net/publication/353376450_A_Survey_on_the_Application_of_WirelessHART_for_Industrial_Process_Monitoring_and_Control_A_Survey_on_the_Application_of_WirelessHART_for