

Pulse Code Modulation Example

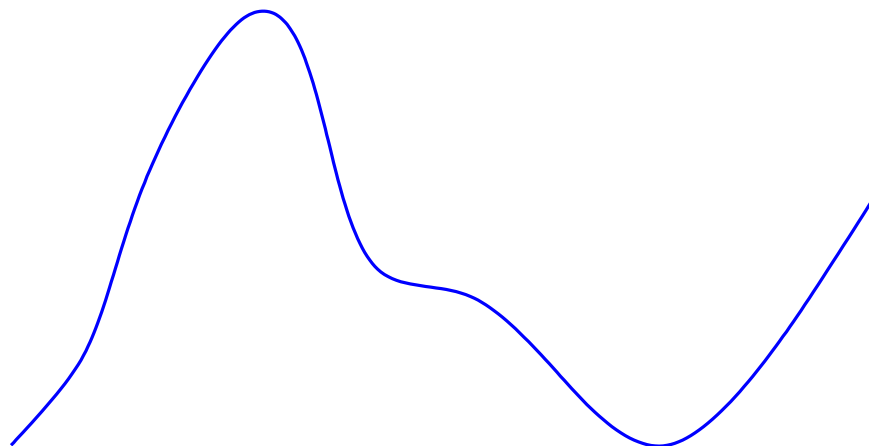
ITS323: Introduction to Data Communications
CSS331: Fundamentals of Data Communications

Sirindhorn International Institute of Technology
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Prepared by Steven Gordon on 4 August 2015
ITS323Y15S1H08, Steve/Courses/2015/s1/its323/lectures/pulse-code-modulation-example.tex,
r3926

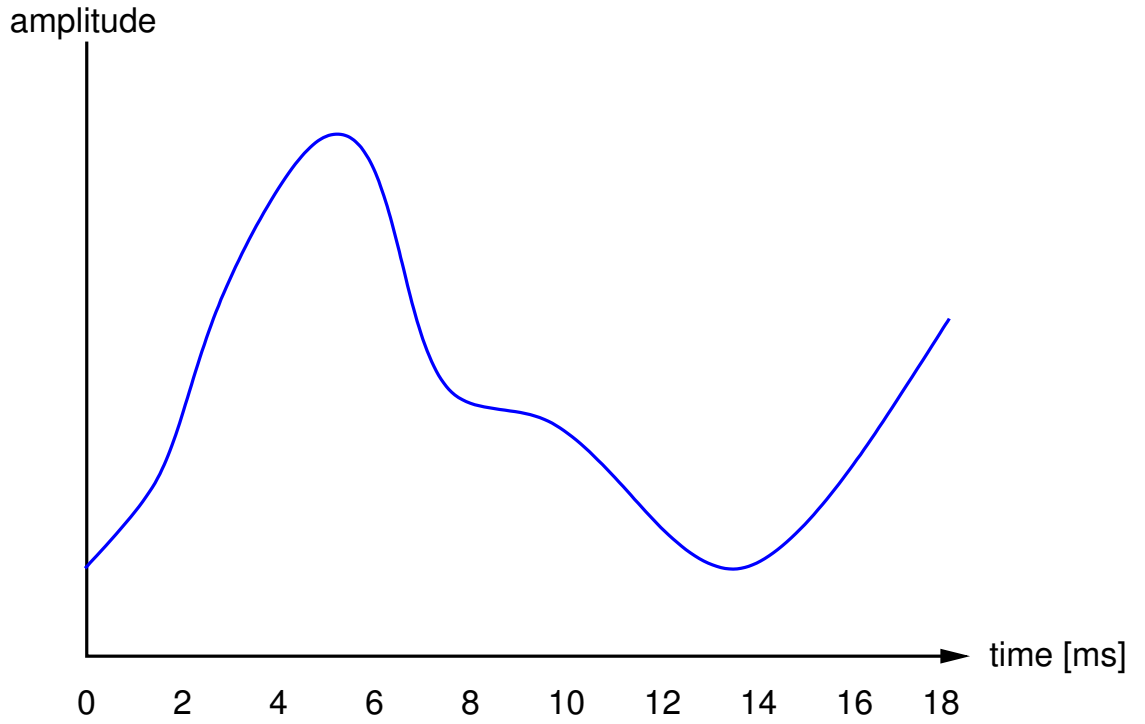
1

Input Analog Data



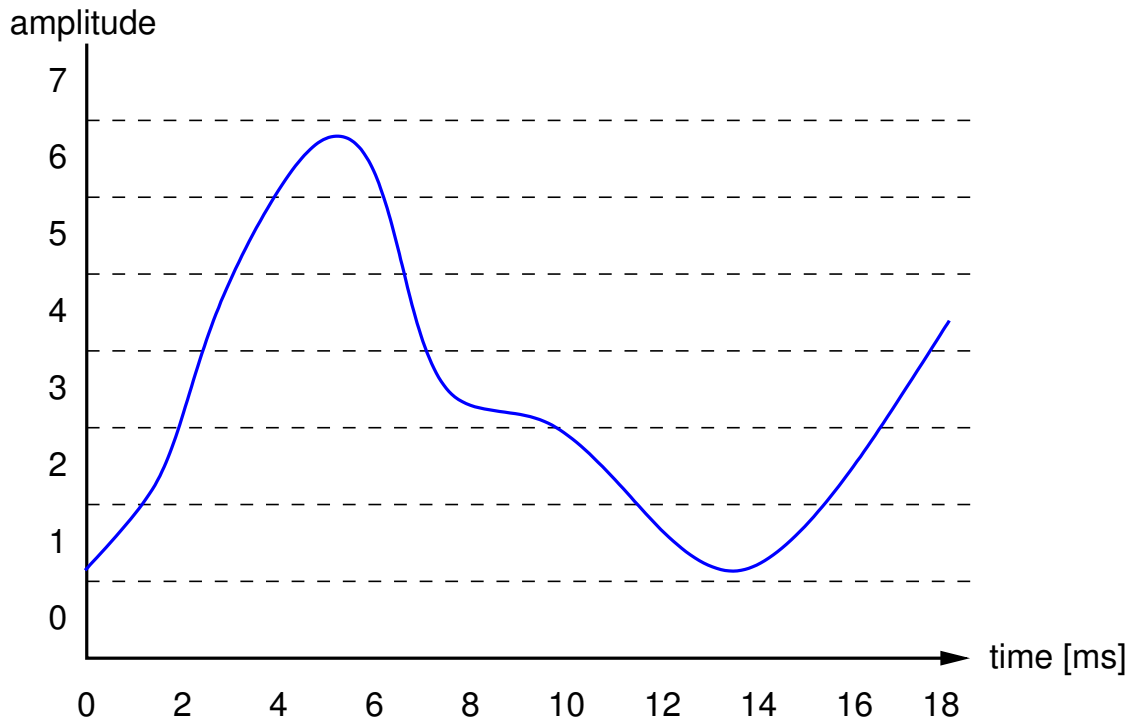
2

Input Analog Data



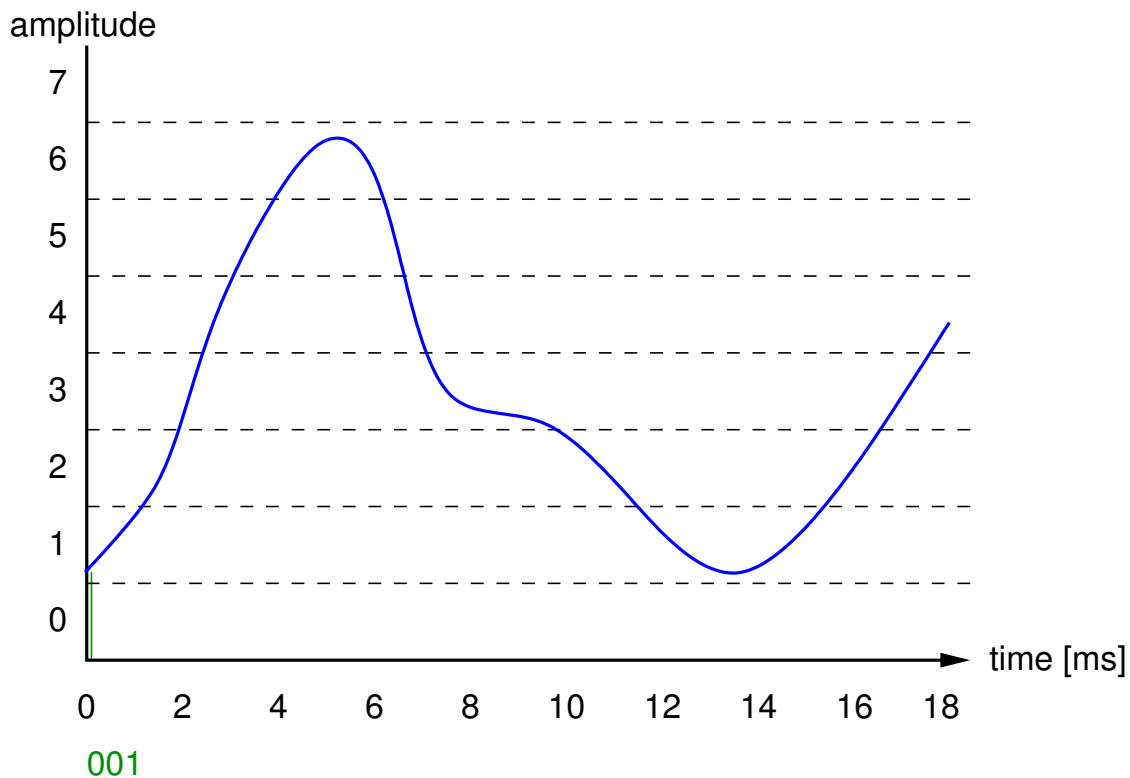
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Case 1: 4ms Sampling Interval; 8 Levels

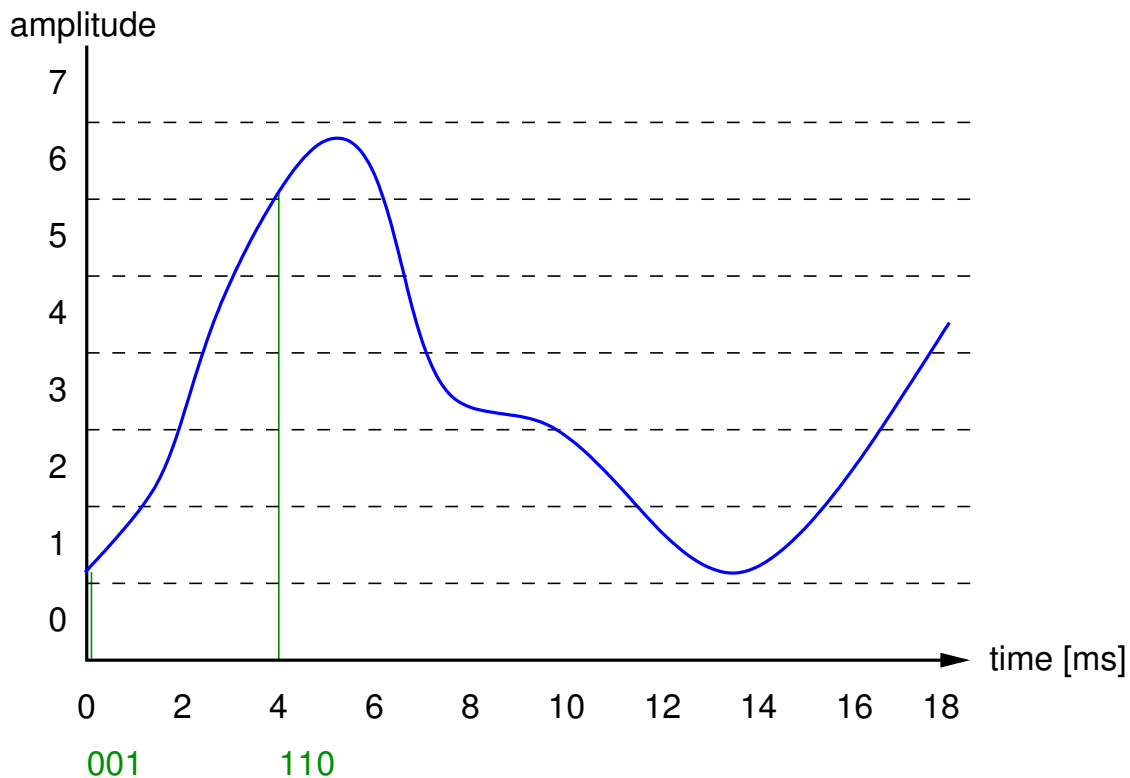


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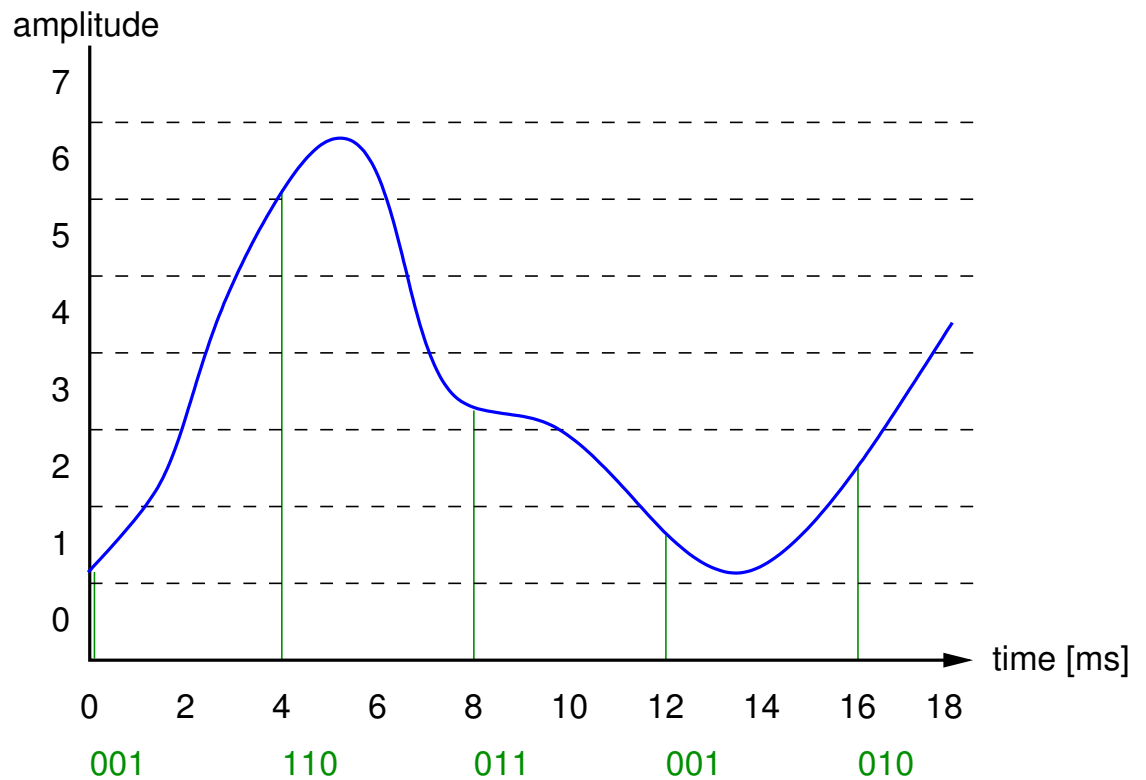
Case 1: 4ms Sampling Interval; 8 Levels



Case 1: 4ms Sampling Interval; 8 Levels

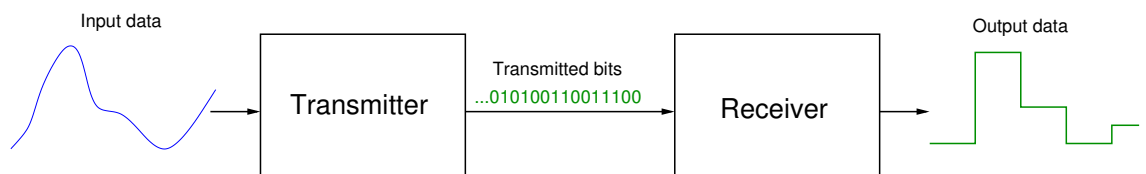


Case 1: 4ms Sampling Interval; 8 Levels



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Case 1: Transmitting the Data

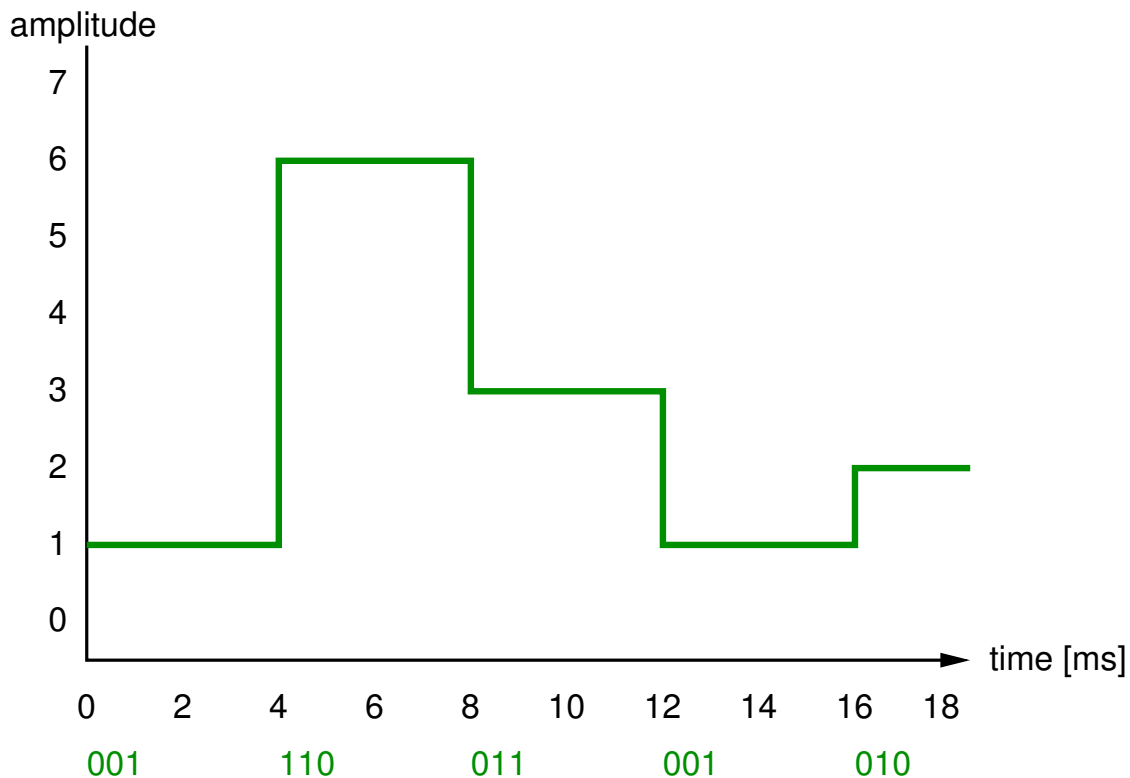


What Data Rate Is Required?

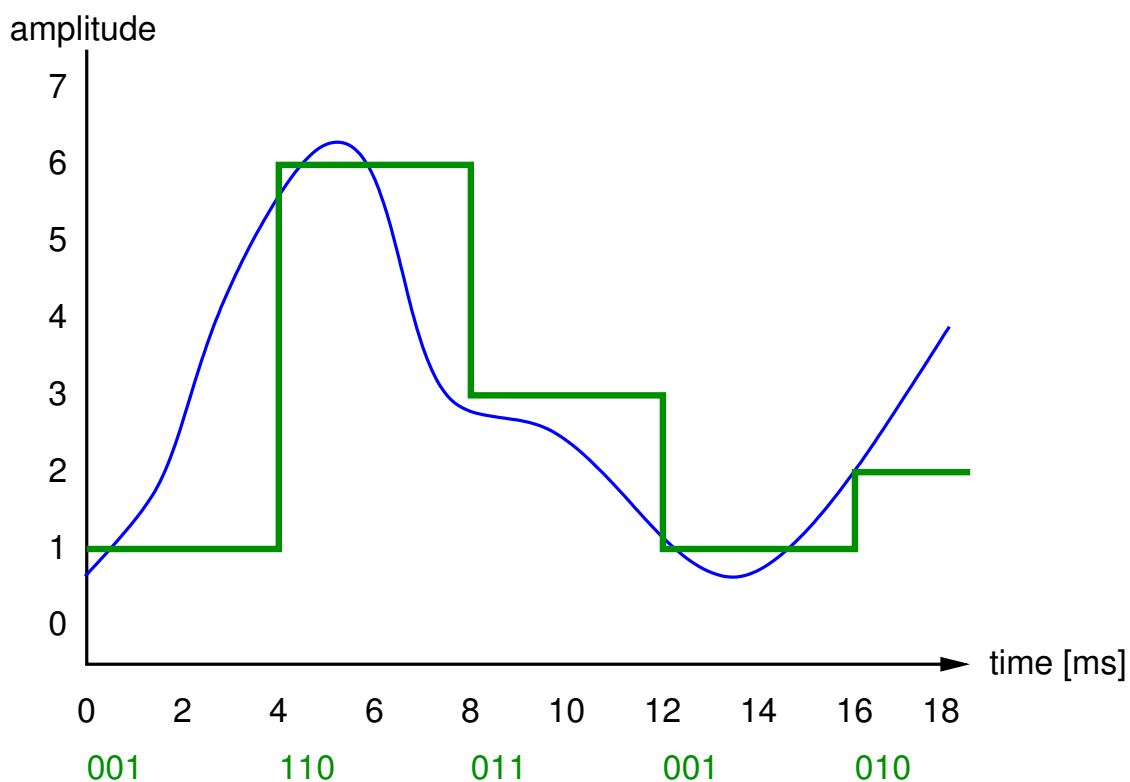
- ▶ 1 sample every 4ms
- ▶ 3 bits per sample
- ▶ 3 bits per 4ms = 750 bps

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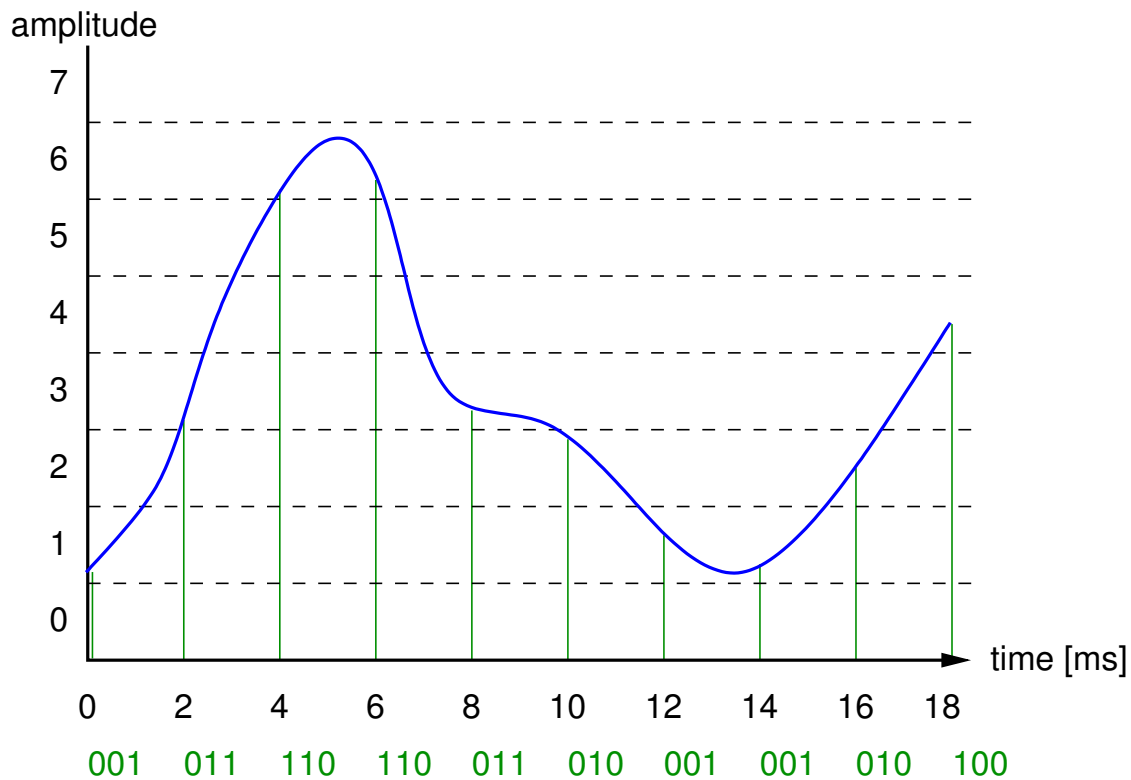
Case 1: Reproduced Data at Destination



Case 1: Comparing Source and Destination Data

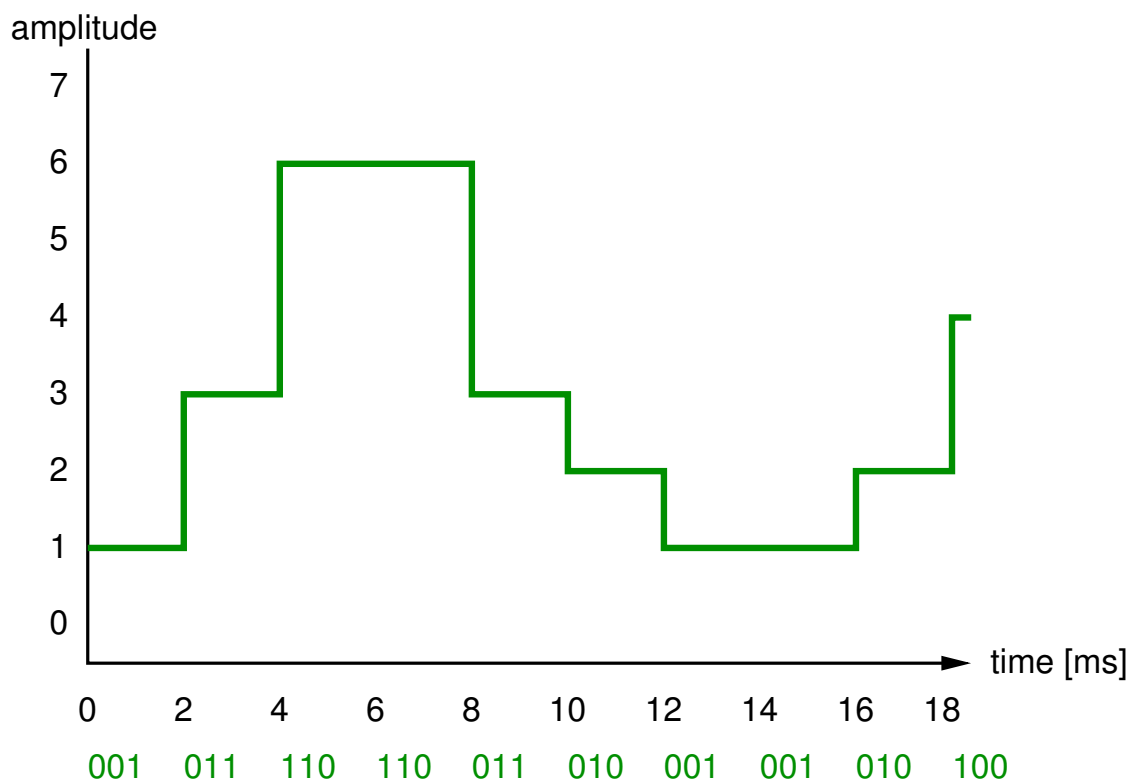


Case 2: 2ms Sampling Interval; 8 Levels



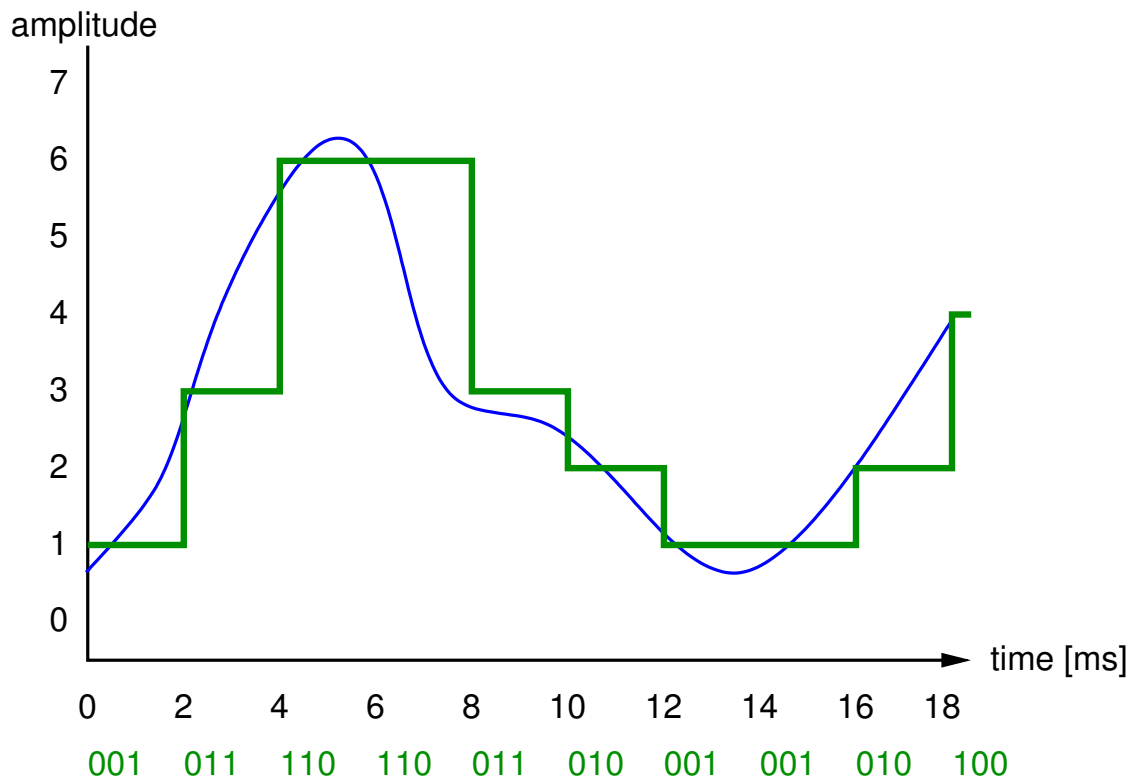
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Case 2: Reproduced Data at Destination



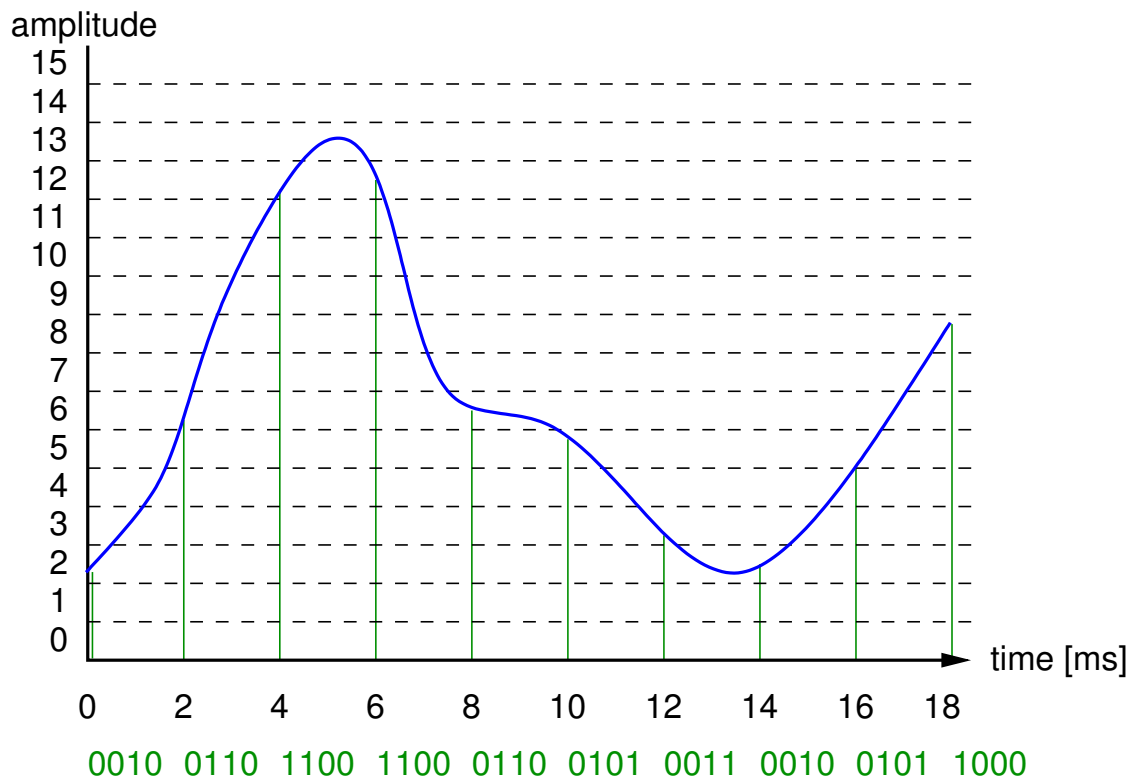
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Case 2: Comparing Source and Destination Data



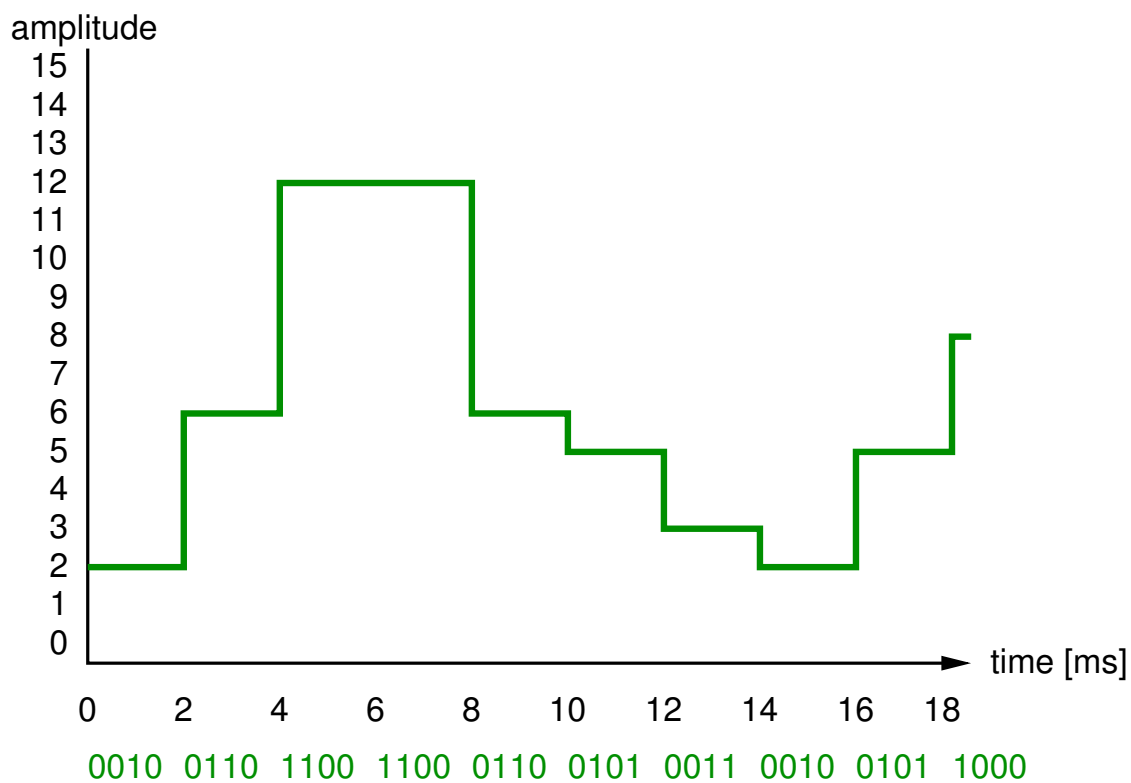
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Case 3: 2ms Sampling Interval; 16 Levels

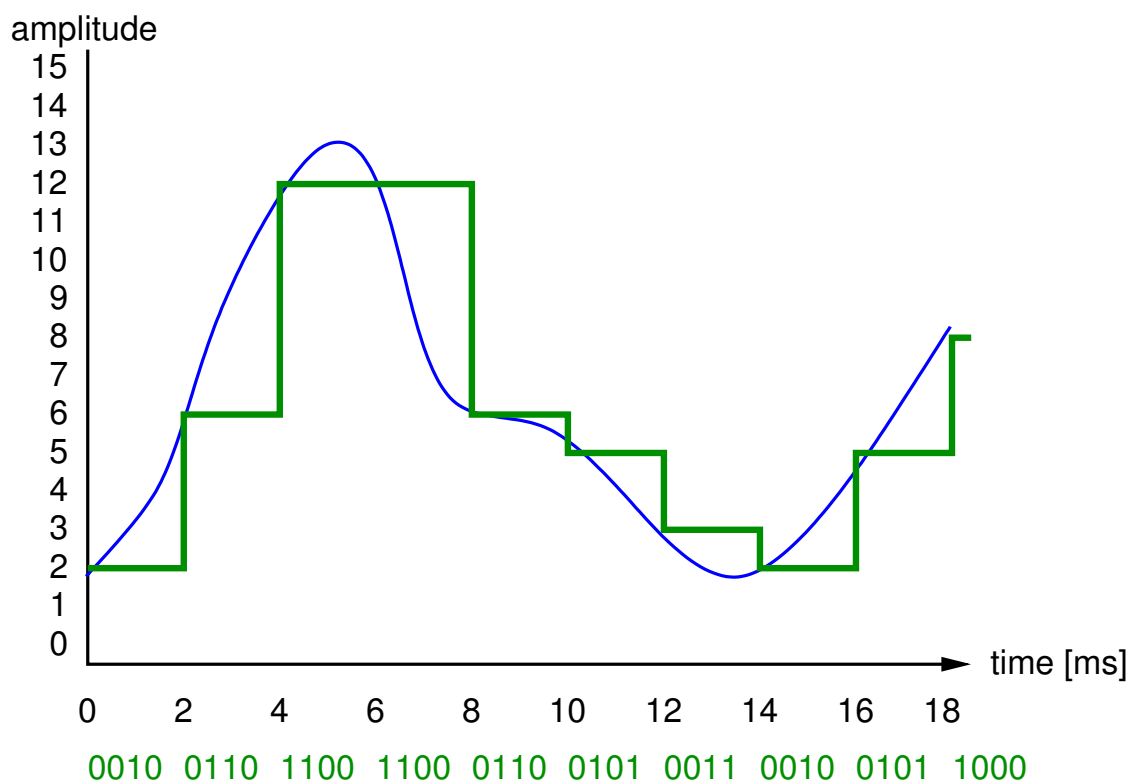


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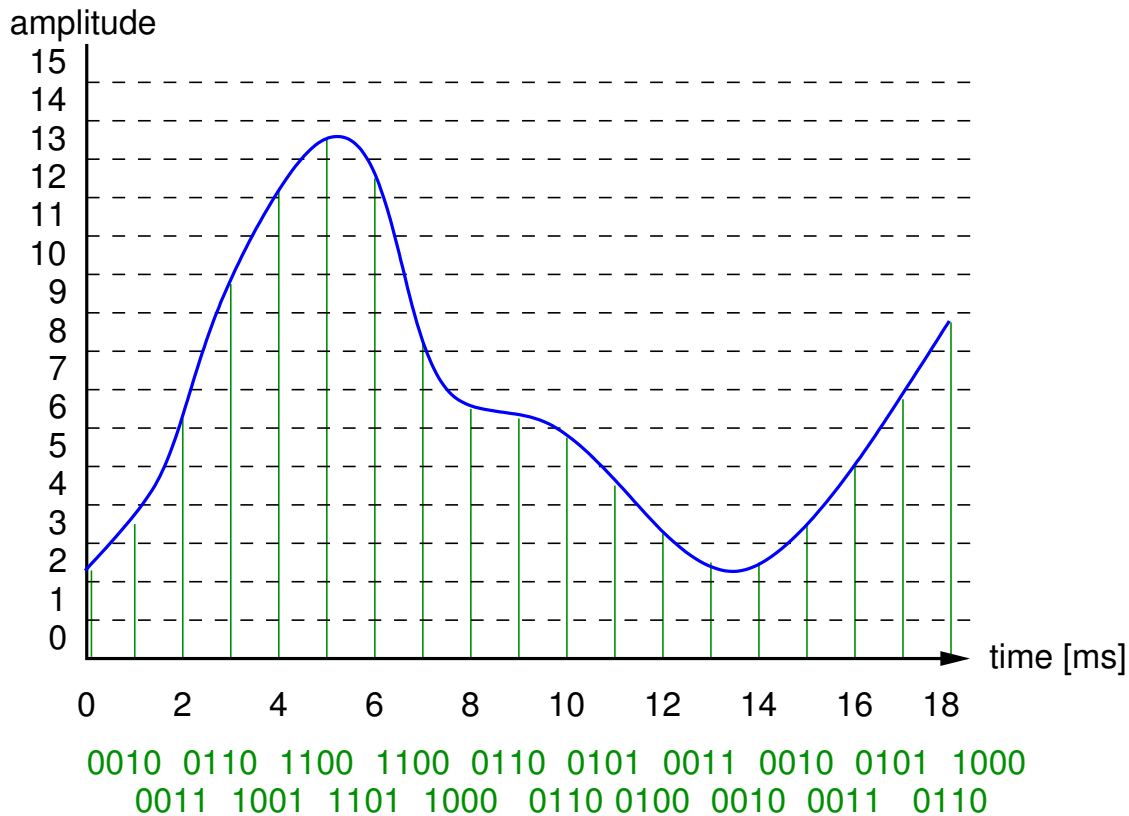
Case 3: Reproduced Data at Destination



Case 3: Comparing Source and Destination Data

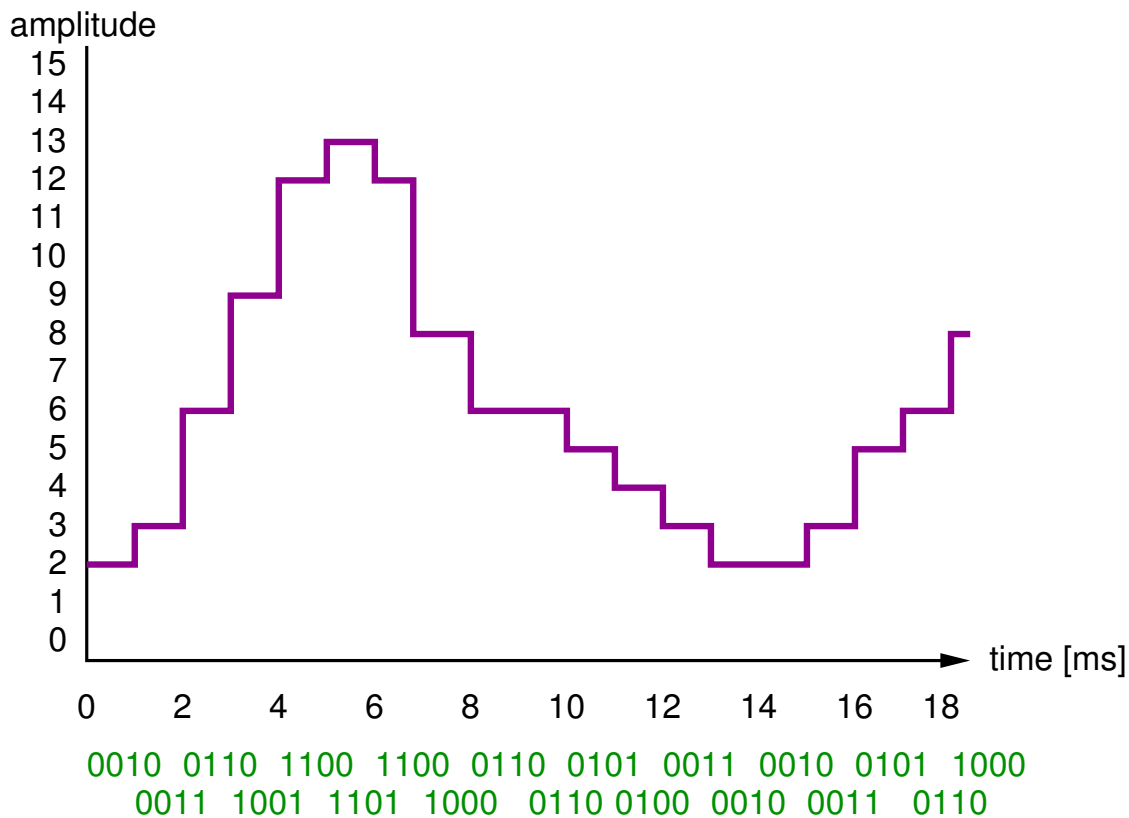


Case 4: 1ms Sampling Interval; 16 Levels



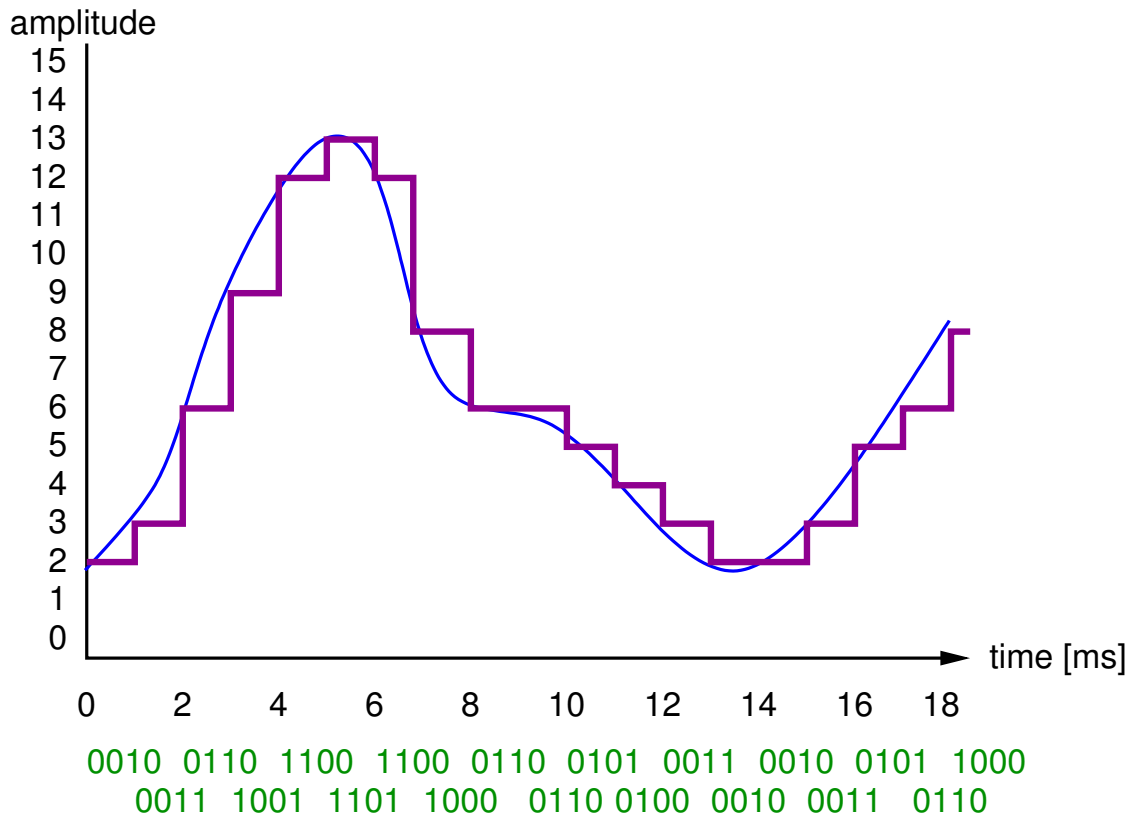
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Case 4: Reproduced Data at Destination

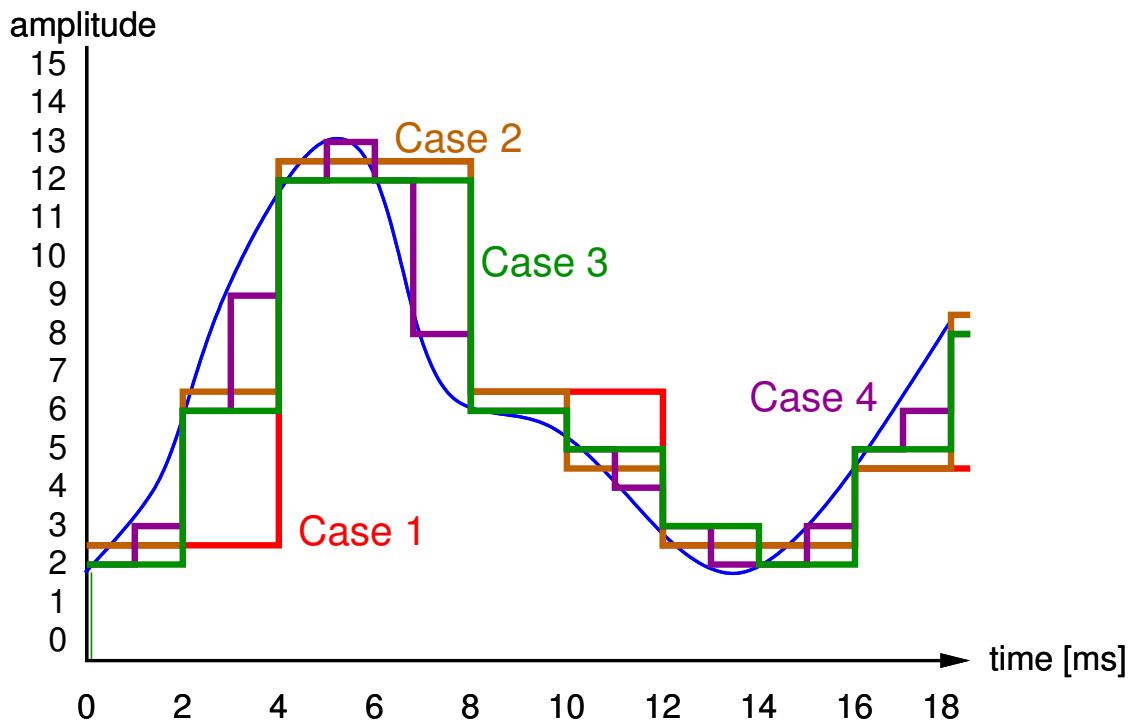


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Case 4: Comparing Source and Destination Data



Comparing All Cases



Tradeoffs

Accuracy of Reproduced Data at Receiver

- ▶ Increasing sampling and/or levels; increased accuracy
- ▶ Case 4 is most accurate representation of original data
- ▶ Case 3 (and 2) are ok, Case 1 not so good

Transmission Data Rate Requirements

- ▶ Increasing sampling and/or levels; increased data rate required to transmit bits
- ▶ Case 1: 750 b/s required
- ▶ Case 2: 1500 b/s required
- ▶ Case 3: 2000 b/s required
- ▶ Case 4: 4000 b/s required