Middleware and Application Software

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Middleware within the embedded systems model

- Reasons to be separate from application software
  - Reusability with other applications
  - Decrease development costs or time by purchasing it from a third party vendor
Networking middleware example

OSI (Open System Interconnection) Model

- Application Layer
- Presentation Layer
- Session Layer
- Transport Layer
- Network Layer
- Data-Link Layer
- Physical Layer

Application Software Layer

System Software Layer

Hardware Layer
OSI model data flow diagram
OSI model layer 1: Physical layer

- Define the networking hardware
OSI model layer 2: Data-link layer

- Format bits into data-link frame, containing data, media access control (MAC) address, etc.
OSI model layer 3: Network layer

- Manage datagram traffic
- Add IP (internet protocol) address
OSI model layer 4: Transport layer

- Point-to-point communication: establish and dissolve communication between two specific devices
- TCP (Transmission Control Protocol): Sent an acknowledge when receiving packet
OSI model layer 5: Session layer

- Connection of two network applications
OSI model layer 6: Presentation layer

- Translate data into formats, e.g. data compression/decompression, data encryption/decryption, and data protocol/character conversions
OSI model layer 7: Application layer

- Network applications by end-users or protocols
TCP/IP, OSI model

TCP/IP Model

OSI Model

Application Layer

Application Layer

Presentation Layer

Session Layer

Transport Layer

Transport Layer

Network Layer

Data-Link Layer

Internet Layer

Network Access Layer

Physical Layer

System Software Layer

Application Software Layer

Hardware Layer
Bluetooth, OSI model

Bluetooth Model

- Application Protocol Group
  - WAP

Middleware Protocol Group

- TCP/IP

Transport Protocol Group

OSI Model

- Application Software Layer
  - Application Layer
  - Presentation Layer
  - Session Layer

System Software Layer

- Transport Layer
- Network Layer
- Data-Link Layer

Hardware Layer

- Physical Layer
References