Node.js I - Getting Started

Chesapeake Node.js User Group (CNUG)

https://www.meetup.com/Chesapeake-Region-nodeJS-Developers-Group

Agenda

- **Installing Node.js**
  - ✓ Background
  - ✓ Node.js Run-time Architecture
  - ✓ Node.js & npm software installation
  - ✓ JavaScript Code Editors
  - ✓ Installation verification
  - ✓ Node.js Command Line Interface (CLI)
  - ✓ Read-Evaluate-Print-Loop (REPL) Interactive Console
  - ✓ Debugging Mode
  - ✓ JSHint
  - ✓ Documentation

Node.js – Background

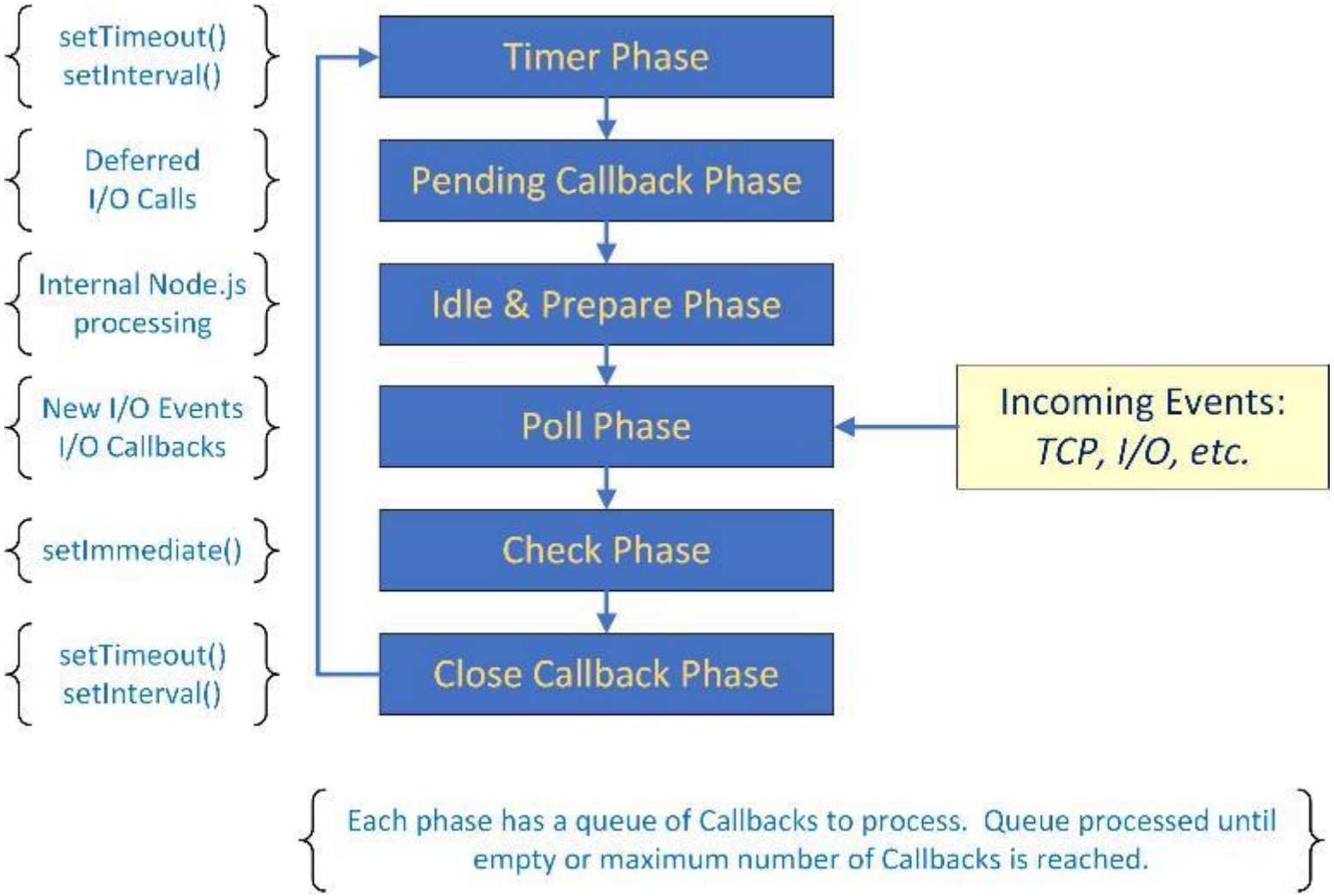
What is Node.js?

- Node.js is a server side (Back-end) JavaScript runtime
- Node.js runs "V8"
  - ✓ Google's high performance JavaScript engine
  - ✓ Same engine used for JavaScript in the Chrome browser
  - ✓ Written in C++
  - ✓ https://developers.google.com/v8/
- Node.js implements ECMAScript
  - ✓ Specified by the ECMA-262 specification
  - ✓ Node.js support for ECMA-262 standard by version:
    - https://node.green/

Node.js – Node.js Run-time Architectural Concepts

- **Node.js is designed for Single Threading**
  - **Main Event listeners are single threaded**
    - ✓ Events immediately handed off to the thread pool
    - ✓ This makes Node.js perfect for Containers
  - **JS programs are single threaded**
    - ✓ Use asynchronous (Non-blocking) calls
  - **Background worker threads for I/O**
  - **Underlying Linux kernel is multi-threaded**
- **Event Loop leverages Linux multi-threading**
  - **Events queued**
  - **Queues processed in Round Robin fashion**

Node.js – Event Processing Loop



Node.js – Downloading Software

- **Download software from Node.js site:**
  - https://nodejs.org/en/download/
  - **Supported Platforms**
    - ✓ Windows (Installer or Binary)
    - ✓ Mac (Installer or Binary)
    - ✓ Linux
    - ✓ SunOS, Docker, IBM Power (AIX, Linux), IBM System z
  - **Long Term Support (LTS)**
    - ✓ Most stable version (8.11)
  - **Current**
    - ✓ Newest features (10.7)

Node.js – Software Installation

- **Windows – Follow installer prompts**
  - **Standard Windows installation**
    - ✓ **Verified for Windows 10**
  - **Make sure to select “npm” if not already installed**
  - **Reboot computer**

JavaScript Code Editors

- Atom (Open Source)
  - https://atom.io/
- Eclipse (IBM)
  - http://www.eclipse.org/downloads/packages/
  - Help → Eclipse Marketplace … → Find → "node"
    - ✓ Nodeclipse (1.0.2)
- Visual Studio (Microsoft)
  - https://code.visualstudio.com/docs/nodejs/nodejs-tutorial

Node.js & npm – Installation Verification

- **Launch a DOS Command Window**
  - Windows → Run → cmd.exe
- **Enter the following commands:**
  - node -v (Verify Node.js installed & in Path)
  - npm -v (Verify npm installed & in Path)

Node.js – Command Line Interface (CLI)

- Windows ".bat" file to launch Command window
  - "c:\Program Files\nodejs\nodevars.bat"
- Execute JavaScript program
  - node *programName*.js
    - ✓ ".js" filename extension optional (assumed if not provided)
- Generate JSDoc from comments
  - jsdoc *programName*.js
  - HTML pages stored in "./out" directory

"node" Command (1): Syntax & Options

- **"node" Program syntax**
  - **node** *options programName*.js -- *scriptArguments*
    - ✓ ".js" is assumed if no file extension is provided
- **"node" Program Options**
  - **Default option is to execute the specified program.**
  - **Other options include:**
    - ✓ -c | --check … *script* | *script*.js (*Syntax check program; no execution*)
    - ✓ -e | --eval … *expression* (*Execute JS expression*)
    - ✓ -h | --help (*Command syntax help*)
    - ✓ -i | --interactive (*Enter interactive programming mode*)
    - ✓ inspect (*Execute program in debugging mode*)
    - ✓ -p | --print … *expression* (*Print JS expression result*)
    - ✓ -r | --require … *module* (*Load JavaScript Module*)
    - ✓ -v | --version (*Display Node.js version*)

“node” Command (2): Arguments

- **“node” Command Arguments**
  - **--**
  - **The “Double Dash” follows the script name**
  - **Arguments follow the “double dash”**
  - **Arguments are passed to the script**
    - ✓ They do NOT affect the execution of the “node” command

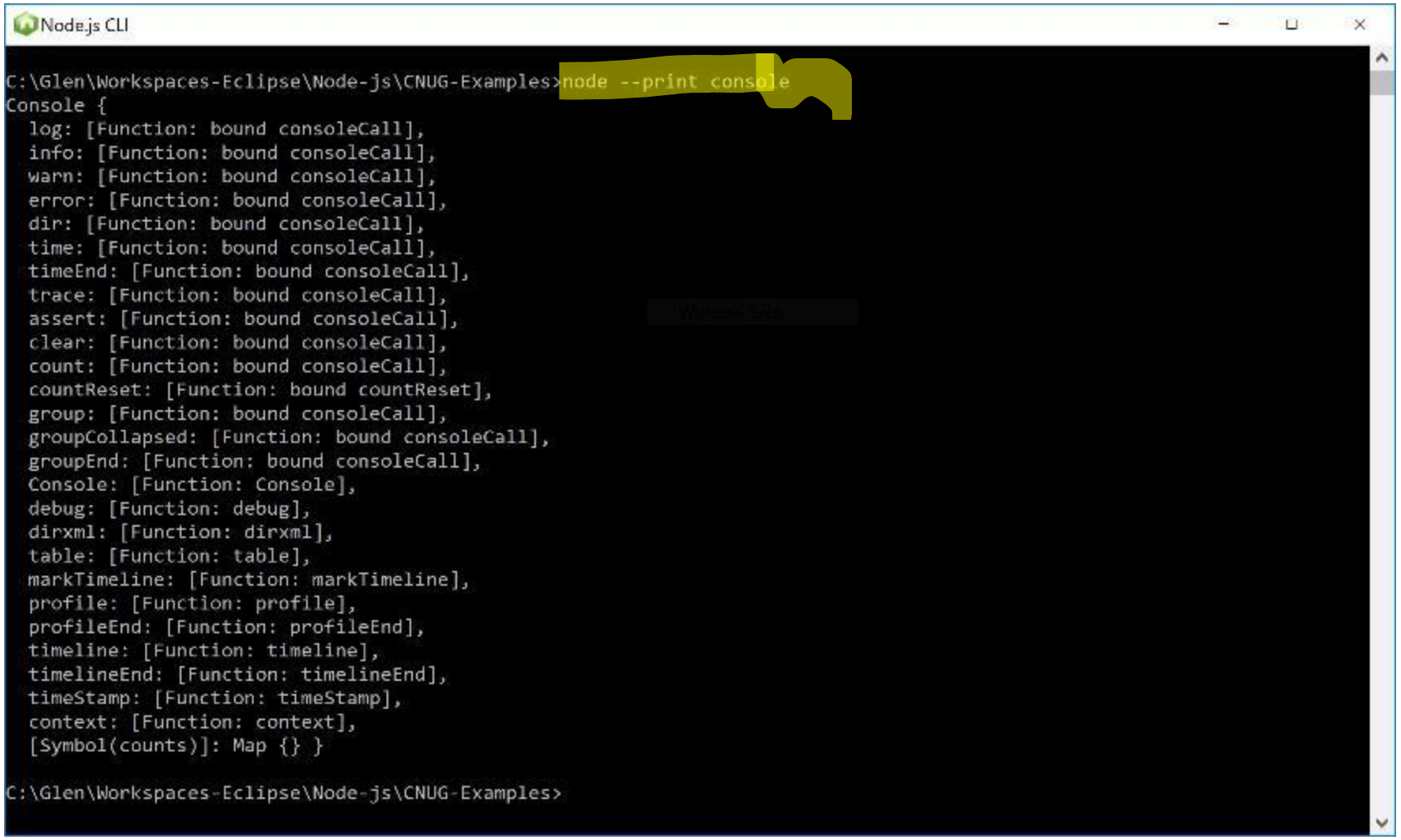
“node ” Command (3): Environment Variables

- **Environment variables affect command execution**
  - **NODE_PATH**
    - ✓ A colon (“:”) separated list of directories to search for scripts.
  - **NODE_NO_WARNINGS**
    - ✓ A value of “1” suppresses warning messages.
  - **NODE_REPL_HISTORY**
    - ✓ Path to the file storing REPL history (.node_repl_history).
  - **NODE_EXTRA_CA_CERTS**
    - ✓ File containing additional CA Signer certificates in PEM format.
  - **OPENSSL_CONF**
    - ✓ Load an OpenSSL configuration file on startup.
  - **SSL_CERT_FILE**
    - ✓ Specify the x.509 certificate Keystore directory.
  - **SSL_CERT_FILE**
    - ✓ Specify the x.509 certificate Keystore filename.

“node” command (4): Object Information

- **Display node.js Object Information**
  - **node -p *object*** **(Display JSON for Object)**
  - **https://nodejs.org/api/globals.html**
- **Global Objects**
  - ✓ **console** (*Provides a console for stdout, stderr*)
  - ✓ **global** (*Global Namespace Object*)
  - ✓ **os** (*Operating System Object*)
  - ✓ **process** (*Current Node.js process Object*)
- **Module Objects**
  - ✓ **module** (*Current Module Object*)
  - ✓ **require** (*Current required Modules*)

“node --print” command example



Node.js – "Read" – "Eval" – "Print" – "Loop" (REPL)

- "node" Interactive Mode
  - REPL (pronounced "repple")
  - Invoked by:
    - ✓ node
    - ✓ node -i | -interactive
  - Process input lines:
    - ✓ "R"ead JavaScript statement
    - ✓ "E"valuate and execute statement
    - ✓ "P"rint the result of the statement
    - ✓ "L" oop through subsequent input lines
      - Terminate REPL with CTRL-C (twice) or CTRL-D (once)
  - Special syntax:
    - ✓ "_" (Underline) represents previous expression

Node.js – Debugging Mode (1)

➢ Entering Debugging Mode

- ❑ Launch node using "**inspect**" option
  - ✓ node inspect *program*.js
- ❑ Add breakpoint(s) to JavaScript program
  - ✓ debugger; statement(s)
- ❑ Execution at breakpoints enters REPL mode

➢ Debugging Functionality

- ❑ Breakpoints can be set in script ("debugger;")
- ❑ Breakpoints can be set during debugging ("sb();")
- ❑ Variables may be "watched" ("watch();")
- ❑ Commands may be executed

Node.js – Debugging Mode (2)

➢ Debug Mode Commands

❑ Define Breakpoints

- ✓ **sb()** — *(Set breakpoint on current line)*
- ✓ **sb(*lineNumber*)** — *(Set a breakpoint at the specified line)*
- ✓ **sb('*function()*')** — *(Set a breakpoint for start of a function)*
- ✓ **sb(*script.js, #*)** — *(Set breakpoint at specified script line)*
- ✓ **cb(*script.js, #*)** — *(Clear specified script breakpoint)*

Node.js – Debugging Mode (3)

➢ Debug Mode Commands - continued

- ❑ **Command Execution ("stepping")**
  - ✓ **c, cont** — (*Resume execution*)
  - ✓ **kill** — (*Terminate script*)
  - ✓ **n, next** — (*Execute next expression*)
  - ✓ **o, out** — (*Step out of an expression*)
  - ✓ **pause** — (*Pause execution*)
  - ✓ **restart** — (*Restart script*)
  - ✓ **s, step** — (*Step into expression*)

Node.js – Debugging Mode (4)

➢Debug Mode Commands - continued

❑ Informational Commands

- ✓ bt, backtrace (*Display expression execution history*)
- ✓ exec(*expr*) (*Execute expression in current context*)
- ✓ list(#) (*Display the surrounding script expressions*)
- ✓ repl (*Enter into REPL mode from current context*)
- ✓ scripts (*List all loaded scripts*)
- ✓ unwatch(*expr*) (*Remove expression from watch list*)
- ✓ version (*Display V8 version*)
- ✓ watch(*expr*) (*Add expression to watch list*)
- ✓ watchers (*Display all watchers and values*)

JavaScript "Linters"

- **Lint is a Code Analysis Tool**
- **There are several JavaScript "Linters" available**
  - **JSLint**
    - ✓ One of the oldest JavaScript Linters
    - ✓ http://www.jslint.com/
  - **JSHint**
    - ✓ Successor to JSLint
    - ✓ http://jshint.com/
  - **ESLint**
    - ✓ Powerful but requires some configuration
    - ✓ https://github.com/eslint/eslint

JSHint – JavaScript Code Analysis Tool

- **JSHint**
  - **Installation**
    - ✓ `npm install -g jshint`
  - **Invocation**
    - ✓ `jshint` *scriptName*
  - **Configured by a .jshintrc file.**
    - ✓ Start search for file in script directory
    - ✓ Works up the directory structure
    - ✓ May need to modify to support ECMAScript 6
      - “esnext” : true
      - “esversion” : 6

Node.js – Official Documentation

- JavaScript API
  - https://nodejs.org/en/docs/
- "node" Command Documentation
  - https://nodejs.org/dist/latest-v7.x/docs/api/cli.html#cli_command_line_options
- Node.js Debugger
  - https://nodejs.org/api/debugger.html
- Node.js Event Loop Processing
  - https://nodejs.org/en/docs/guides/event-loop-timers-and-nexttick/

Questions?


Thank
You