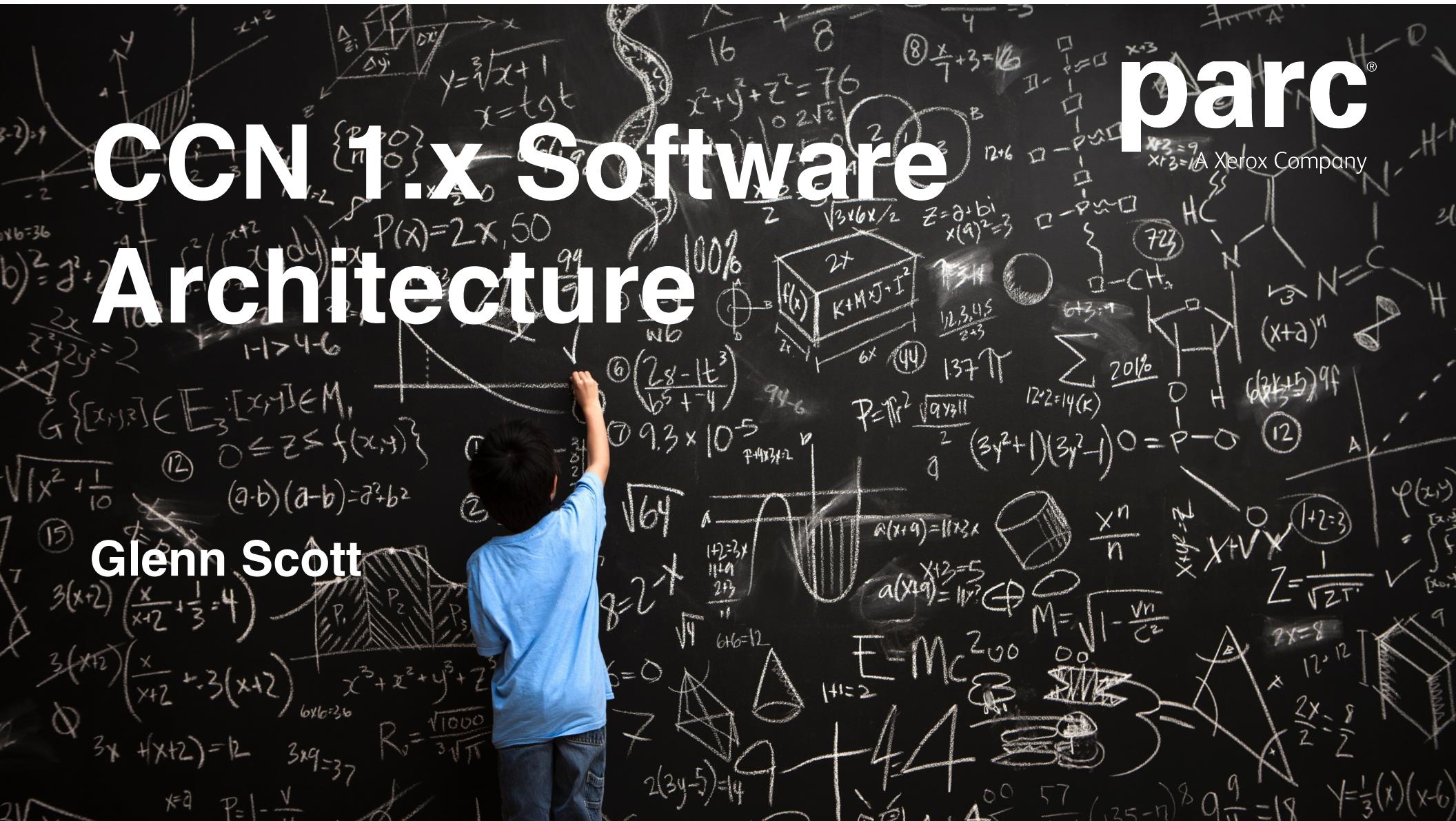


# CCN 1.x Software Architecture

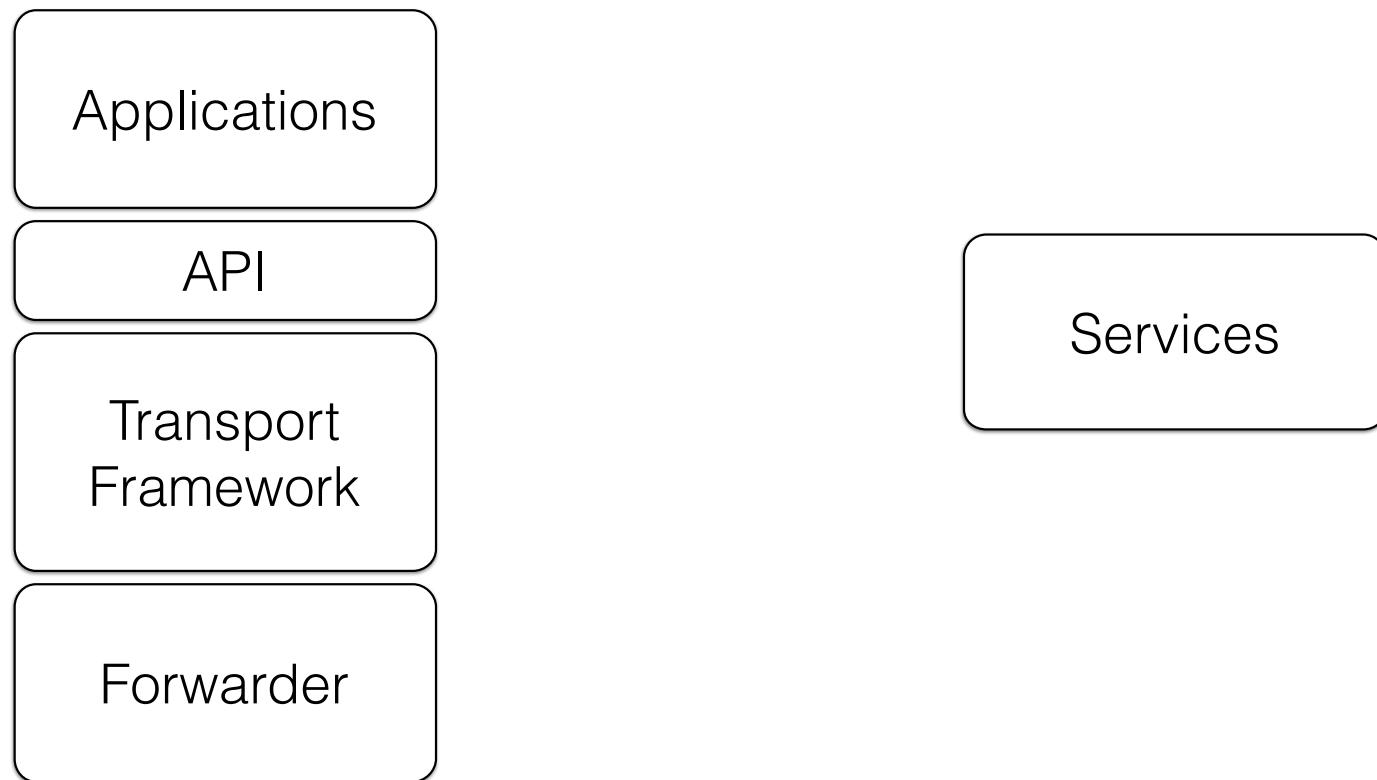
Glenn Scott

parc®

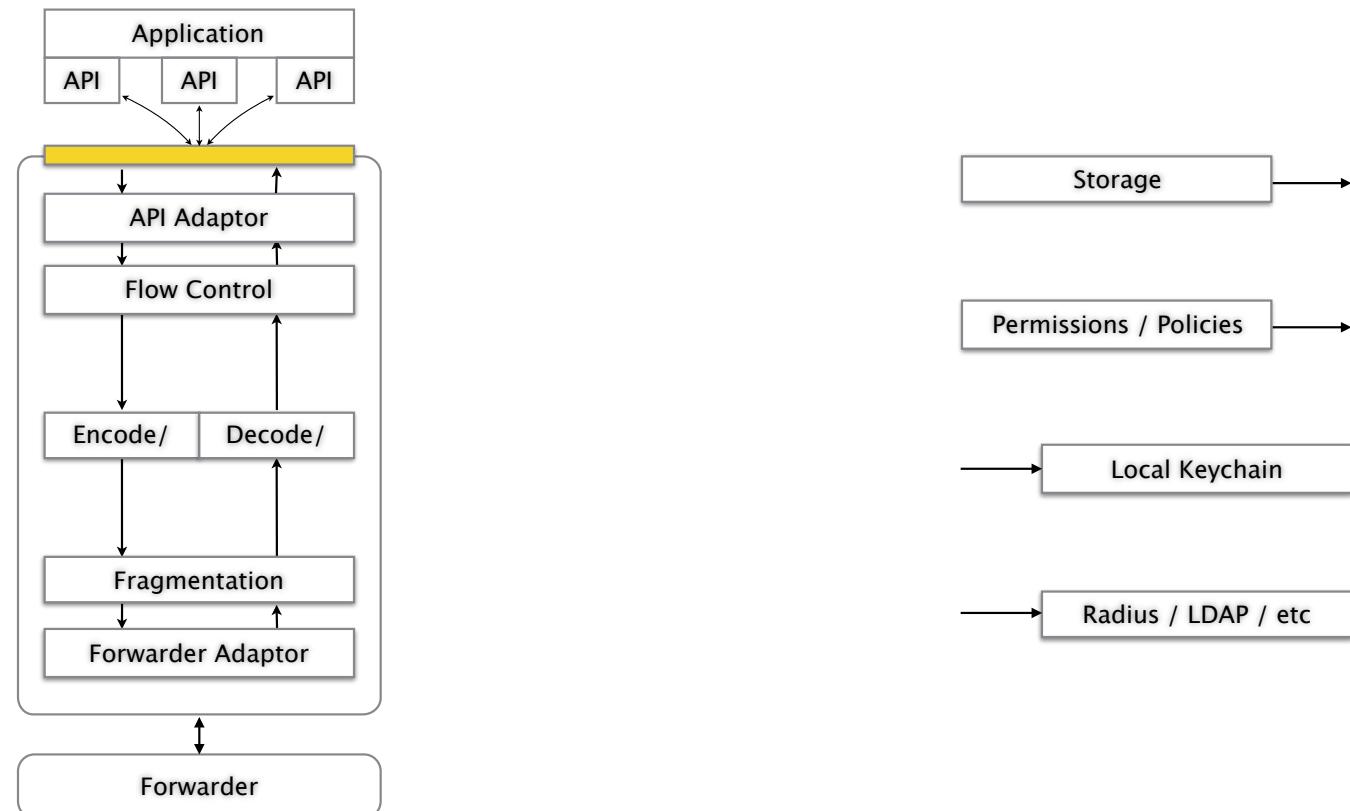
A Xerox Company



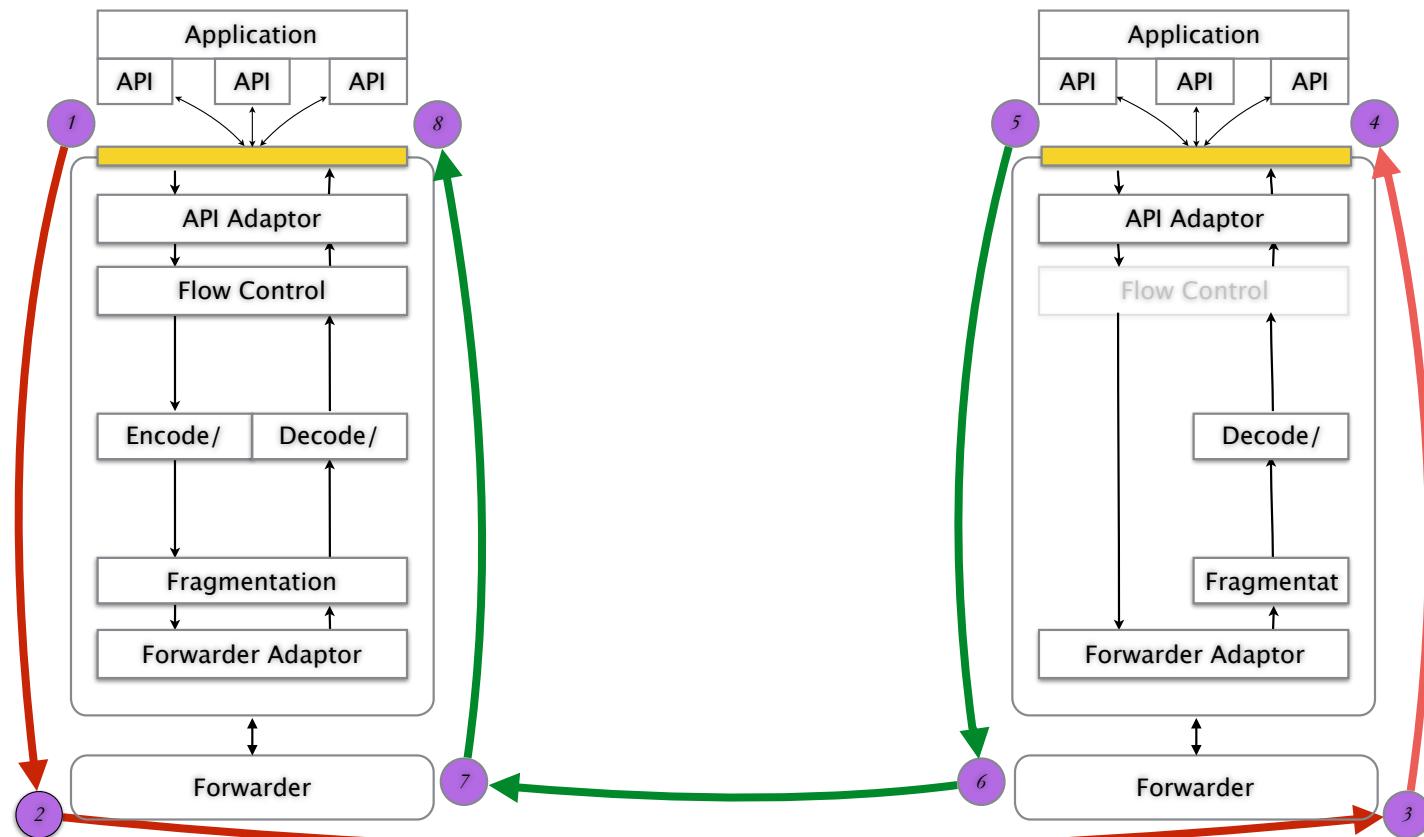
# The CCN software architecture



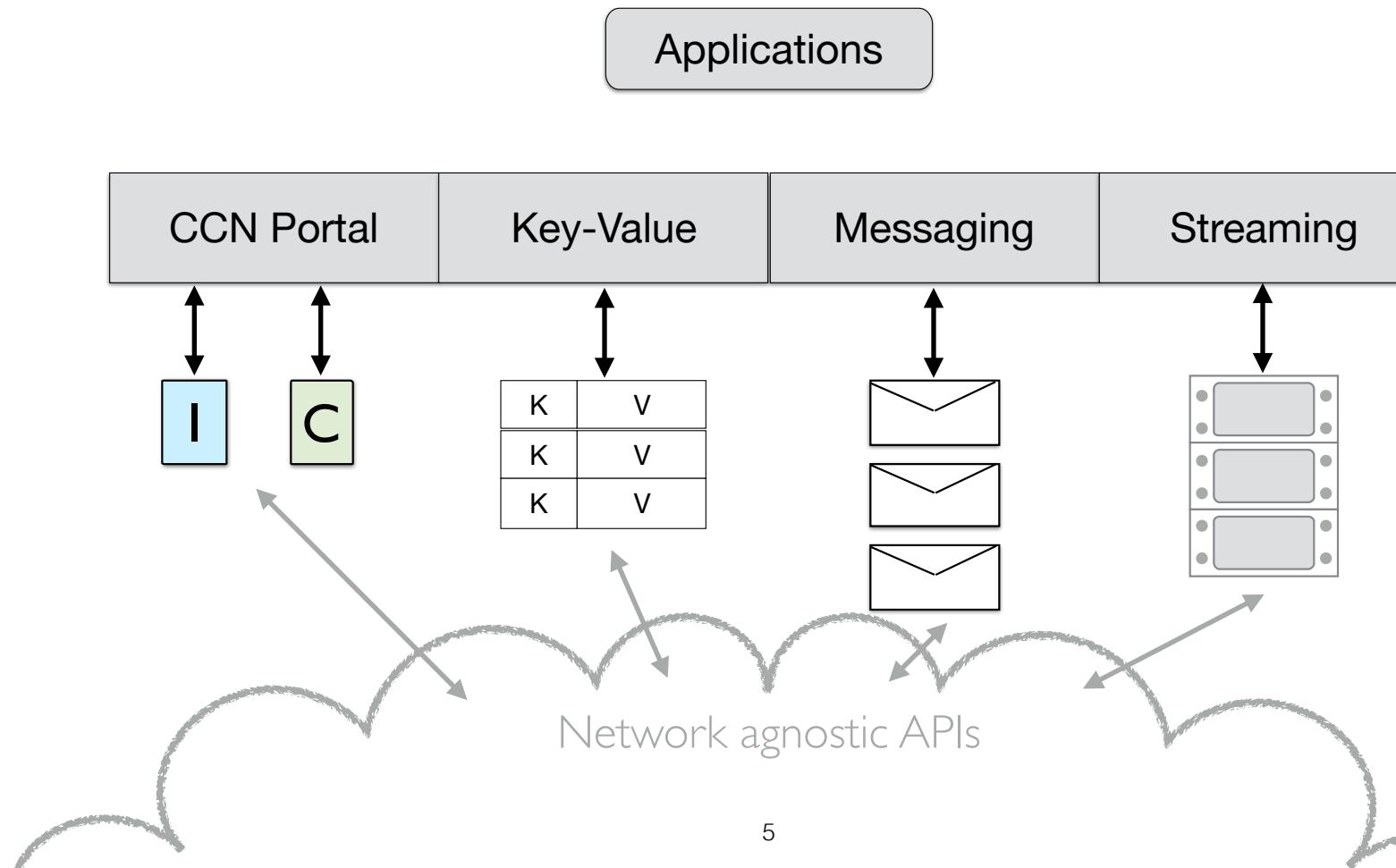
# The CCN transport stack



# Transport Stack



# CCN Services and API characteristics



# CCN - 1.0 Software

# CCN 1.0 Software

What Is It?

What Is Different?

How Do I Use It?

# CCN 1.0 Software

## What Is It?

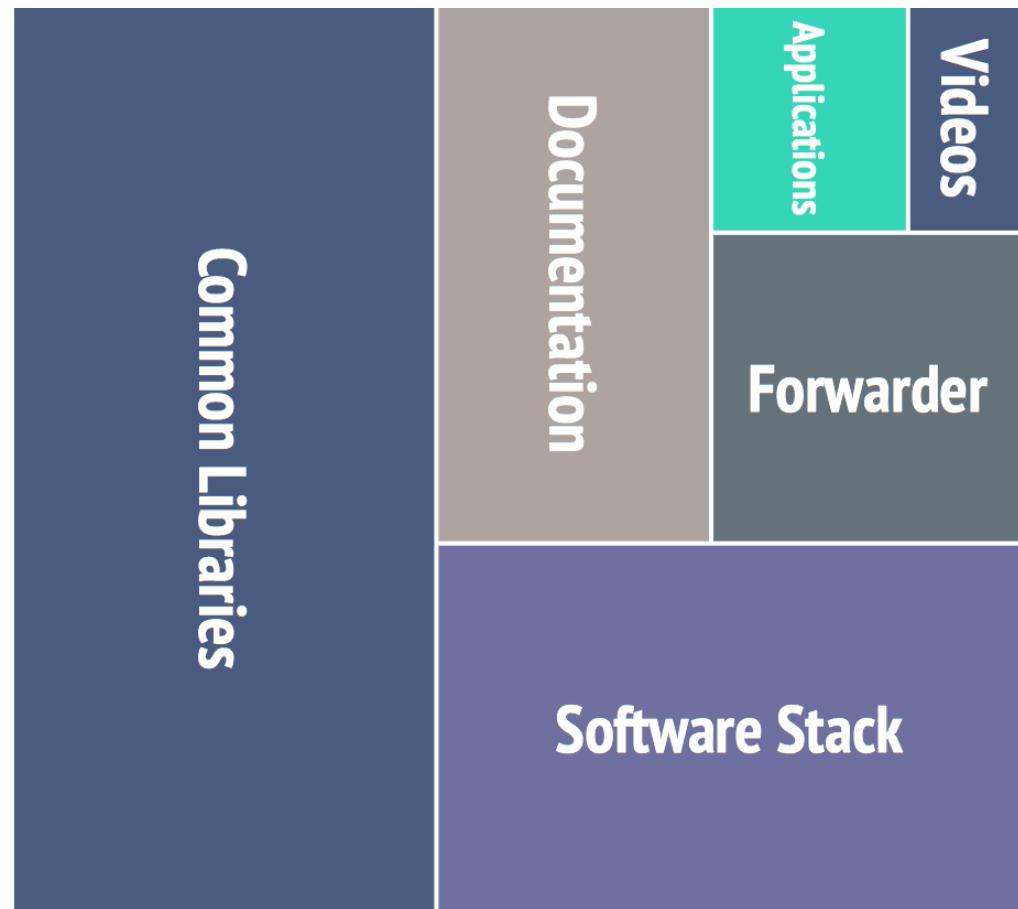
Application Programs

Software Stack

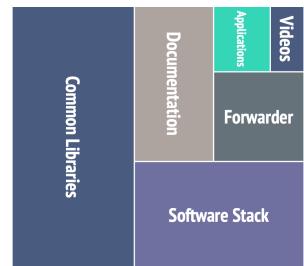
Common Libraries

Documentation

Instructional Videos



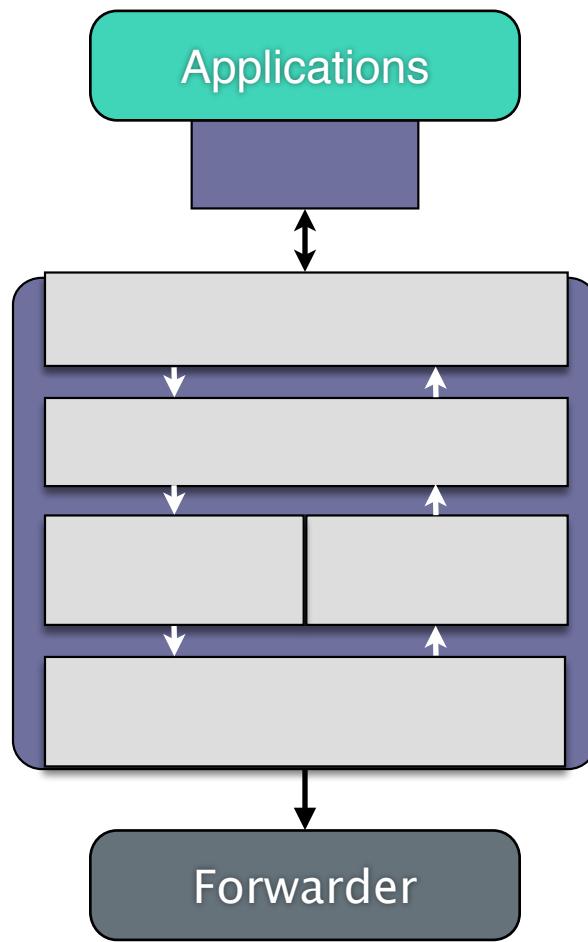
# CCN 1.0 Software



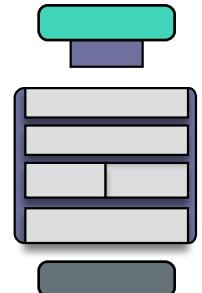
## CCN Software Stack

Portal API

Transport Framework



# CCN 1.0 Software

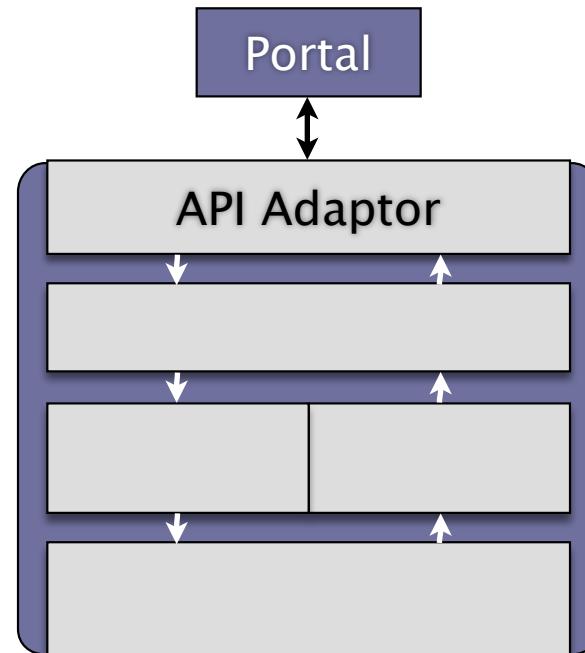


## CCN Portal API

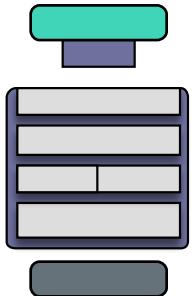
Streaming  
Datagram  
Blocking  
Non-blocking

### Portal

ccnxPortal\_Listen  
ccnxPortal\_Read  
ccnxPortal\_Write  
ccnxPortal\_Release  
ccnxPortal\_Acquire  
ccnxPortal\_Ignore  
ccnxPortal\_IsEOF  
ccnxPortal\_IsError



# CCN 1.0 Software

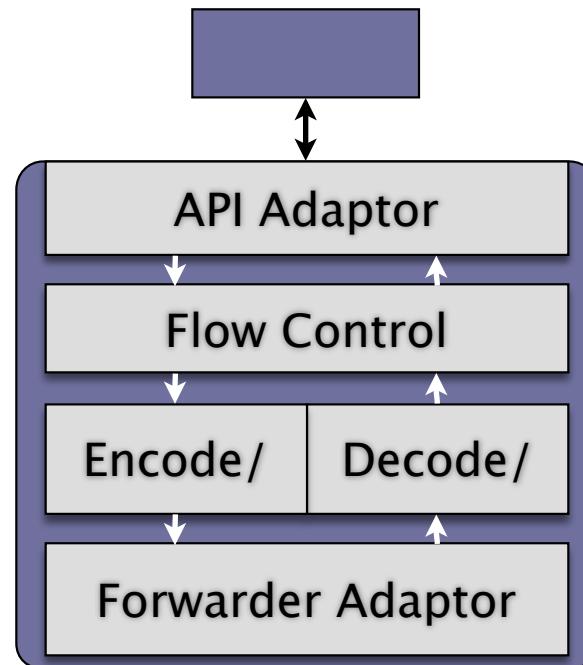


## Transport Framework

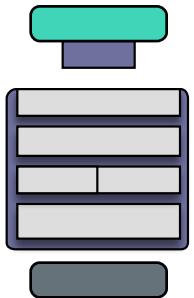
Component Based Design

Dynamically Plumbed

Dynamically Loaded Modules (future)



# CCN 1.0 Software



Easy to Use

Simple application

No special privileges

## Forwarder

**Built For Experimenting**

Configurable Cache Size

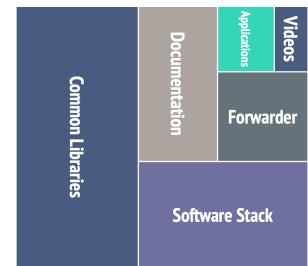
In memory cache, 0 to ...

CCN 1.0 Packet Format

TCP/IP encapsulation

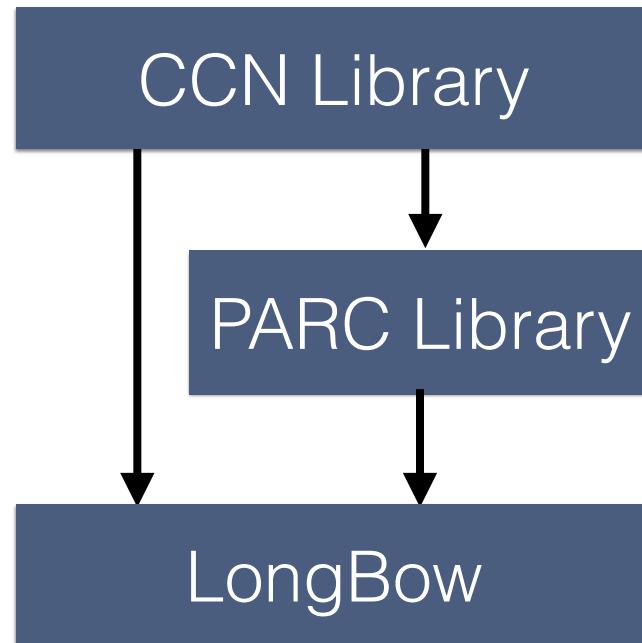
Native ethernet

# CCN 1.0 Software

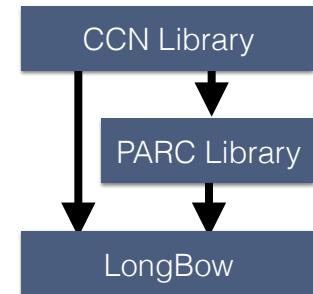


## Common Libraries

Used By Everything  
Reference Down,  
No Reference Up



# CCN 1.0 Software



**CCN Library**

Application Writer's View

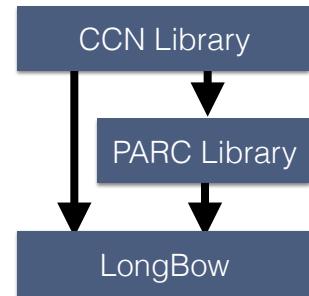
**CCNxContentObject**  
**CCNxName**  
**CCNxInterest**  
CCNxPortalMessage  
CCNxNameSegmentType  
CCNxKeystoreUtilities

# CCN 1.0 Software

**CCN Library**

API Writer's View

**CCNxControl**  
**CCNxMessage**  
**CCNxName**  
**CCNxInterest**  
**CCNxContentObject**  
**CCNxKeyLocator**

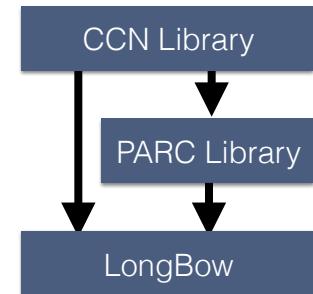


# CCN 1.0 Software

## CCN Library

Component Writer's View

CCNxValidationFacade  
CCNxContentObject  
CCNxControlFacade  
**CCNxTlv**<sup>CCNxControl</sup><sub>CCNxName</sub>  
**CCNxTlvDictionary**  
**CCNxMessage**  
**CCNxWireFormatFacade**  
CCNxJson  
CCNxNetworkBuffer

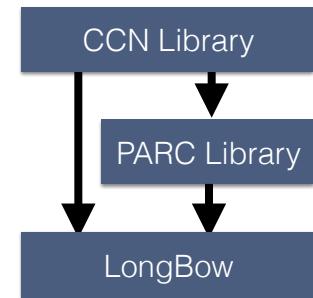
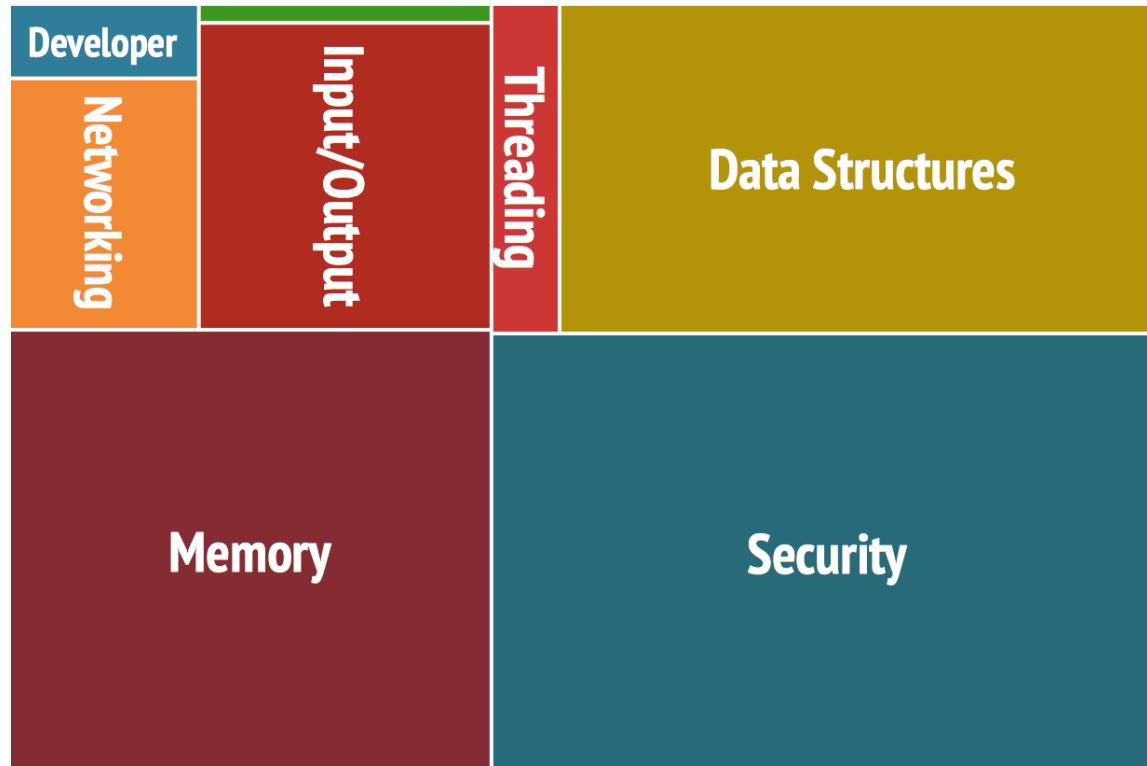


# CCN 1.0 Software

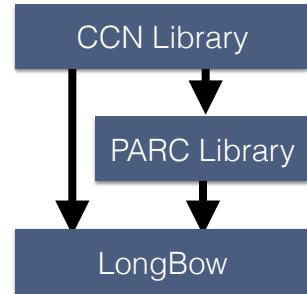
## PARC Library

C Utility Functions

General Purpose



# CCN 1.0 Software



## Runtime Assertions and Traps

assertTrue	trapIllegalValue
assertFalse	trapNotImplemented
assertNull	TrapOutOfBounds
assertNotNull	trapOutOfMemory
	trapUnexpectedState

## LongBow

Write Better C Programs

## Native C Unit Test Framework

- xUnit-style testing for C (in C)
- Integrates with runtime assertions and traps
- Integrated with automake, Xcode, Eclipse

# CCN 1.0 Software

## What Is Different?

Written for Extension and Experimentation

Written for People

Measured

# CCN 1.0 Software

## Written for Experimentation

Interface Based Architecture

Clear Separation of Concerns

Simple to Substitute Different Implementations

Modular Design

Promotes Extensibility

Interoperability Testing

Graduated/Progressive Implementation

# CCN 1.0 Software

## Written For People

Human Factors Emphasis

Documentation

Function Documentation

Tutorial Guides

Consistent Design and Style

Measured Software

# CCN 1.0 Software

## Documentation

100% Coverage

Module,

Function,

Enumeration

Type

IDE Integration

Printed and Online

```
// Get the actual contents of the specified chunk of the file.
PARCBuffer *payload = tutorialFileIO_GetFileChunk(fullFilePath
```

Declaration	PARCBuffer *tutorialFileIO_GetFileChunk(const char * fileName, size_t chunkSize, uint64_t chunkNumber)
Description	Given a fileName and chunk number, retrieve that chunk from the specified file. The contents of the chunk are returned in a PARCBuffer that must eventually be released via a call to parcBuffer_Release(&buf). The chunkNumber is 0-based.
Parameters	fileName[in] A pointer to a string containing the name of the file to read from. chunkSize[in] The maximum number of bytes to be returned in each chunk. chunkNumber[in] The 0-based number of chunk to return from the file.
Returns	A newly created PARCBuffer containing the contents of the specified chunk.
Declared In	tutorial_FileIO.h

am [in] requested chunkNumber The number of the requested chunk

# CCN 1.0 Software

## Consistent Design and Style

Uniform Code Style  
Clean and Clear Naming  
High Cohesion  
Low Coupling

The image displays two screenshots of PARC documentation pages, both from the Palo Alto Research Center Computing Science Laboratory.

**PARC C Style Guide** (Left): This page is titled "PARC C Style Guide" and is authored by Glenn Scott. It includes sections for Abstract, Introduction, and Contents. The Contents table of contents lists various style rules such as Function Names and Semantics, General Guidelines, and Acknowledgments. The page also features a "PARC Library Canonical C Function Name Conventions" section with its own abstract and table of contents.

**PARC Design Namespaces for C Programs** (Right): This page is titled "PARC Design Namespaces for C Programs" and is also authored by Glenn Scott. It includes sections for Abstract, Introduction, and Contents. The Contents table of contents lists various design principles such as Name Spaces, Name Files, and Name Constants. The page also features a "PARC Design Managing Modularity and Coupling in C Programs" section with its own abstract and table of contents.

# CCN 1.0 Software

## Measured

- Style Conformance
- Naming Conformance
- Unit Testing
- Documentation Coverage
- Complexity Management

## Developer Tools

- Readiness and Acceptance

# CCNx Dashboard

## Source Code

	Main	Testing	Test Coverage
Forwarder	19	16	<div style="width: 74%; background-color: #007bff; height: 10px;"></div>
APIs	14	8	<div style="width: 57%; background-color: #007bff; height: 10px;"></div>
Transport	27	15	<div style="width: 55%; background-color: #007bff; height: 10px;"></div>
CCN Library	25	14	<div style="width: 56%; background-color: #007bff; height: 10px;"></div>
PARC Library	38	21	<div style="width: 55%; background-color: #007bff; height: 10px;"></div>
LongBow	10	...	<div style="width: 50%; background-color: #007bff; height: 10px;"></div>
<b>Total Lines</b>	<b>136k</b>	<b>77k</b>	<b>74%</b>

## Developer Documentation

	Print	HTML	Coverage
Forwarder	315	354	<div style="width: 88%; background-color: #007bff; height: 10px;"></div>
APIs	301	239	<div style="width: 79%; background-color: #007bff; height: 10px;"></div>
Transport	438	471	<div style="width: 92%; background-color: #007bff; height: 10px;"></div>
CCN Library	604	234	<div style="width: 39%; background-color: #007bff; height: 10px;"></div>
PARC Library	907	413	<div style="width: 45%; background-color: #007bff; height: 10px;"></div>
LongBow	225	175	<div style="width: 77%; background-color: #007bff; height: 10px;"></div>
<b>Total Pages</b>	<b>2,864</b>	<b>1,972</b>	<b>92%</b>

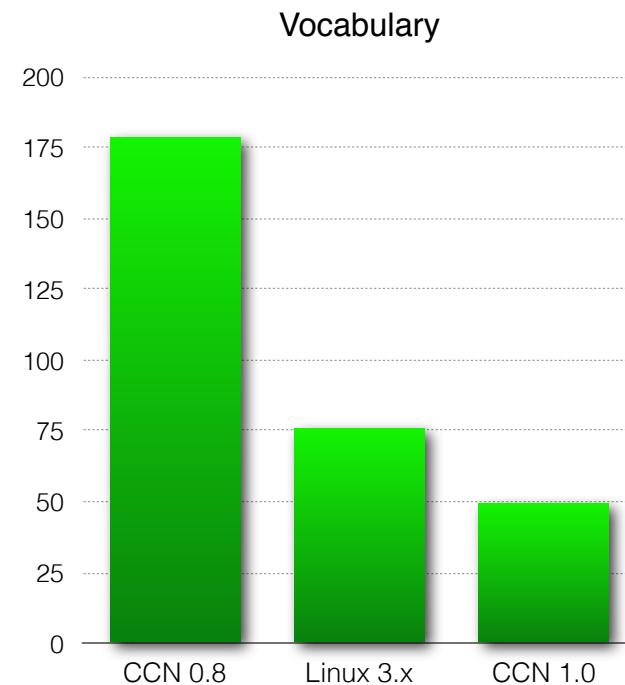
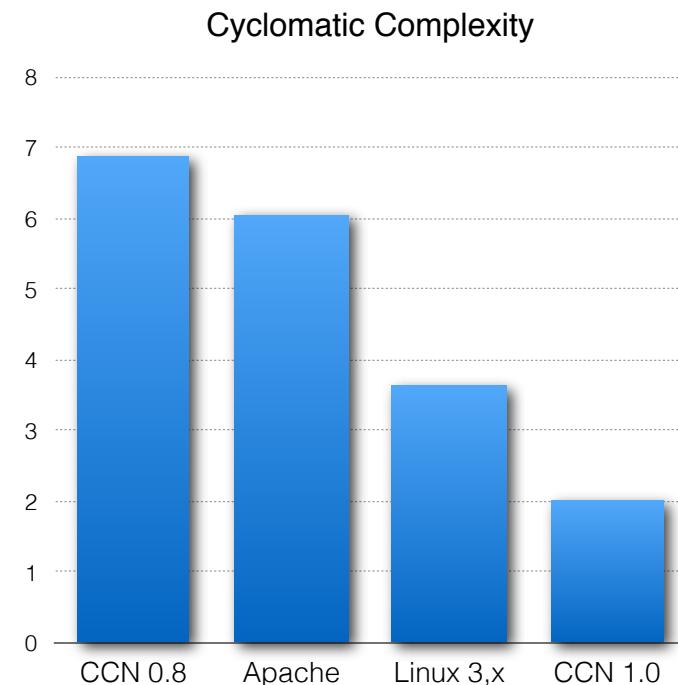
## Code Complexity

	Cyclomatic	Vocabulary
Forwarder	1.77	55
APIs	1.88	51
Transport	2.43	70
CCN Library	2.29	45
PARC Library	1.97	43
LongBow	2.00	39
<b>Average</b>	<b>2.00</b>	<b>50</b>

## Design: Modularity



# CCN 1.0 Software



# CCN 1.0 Software

## How Do I Use It?

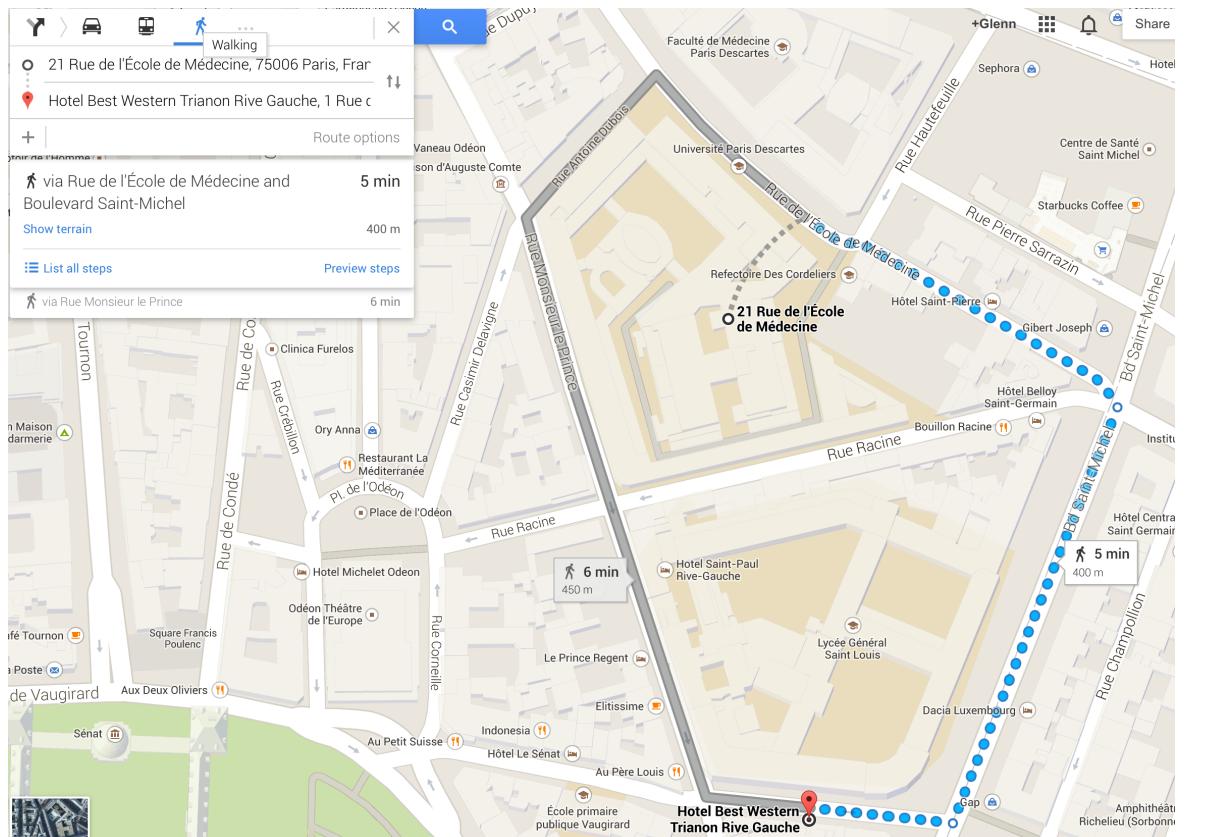
Install CCN 1.0 Software

Use Portal API

Link Application with Libraries

Run

Sit back, enjoy





**parc**<sup>®</sup>

A Xerox Company

**Thank you**

<http://www.ccnx.org/>