Real-World Guidance from a Leading Practitioner:

How to Define
# Your Campus Network Components

Topic 1

Introduction

When designing your campus network architecture, it is important to adopt a structured process and focus not just on the physical but logical campus boundaries.

Dependent upon your timelines, resources and budget, you may follow traditional enterprise network design processes or another approach.

But remember, you are not the first to embark on such a project and there are many sources of advice and support that you can leverage along the way.
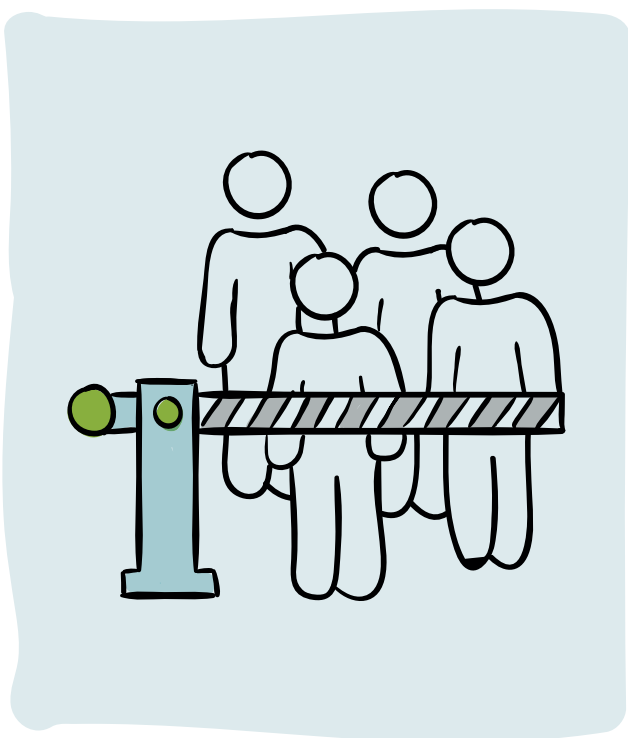
About the Author:
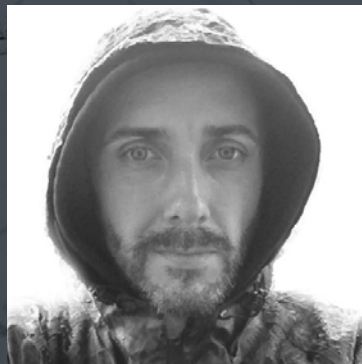
Donal wears many hats and believes we are all network engineers in one form or another. He consults at Defensible, builds engineering testing tools at PanSift, and grows community at iNOG. Donal hails from a mix of engineering and security roles in telco/mobile, enterprise, vendors, and start-ups. He's previously held multiple industry certifications (including a very early CISSP) and comes from a computer science background. These days he gets most satisfaction when growing communities of practice.

– Donal O Duibhir

Define Your Campus

There is no ubiquitous definition of the term 'campus'. While it originates from universities, along the way, the term has spawned many variations on the campus theme.

Understanding the definition of a campus network helps to identify the perceived versus actual 'edges' in a campus network design.
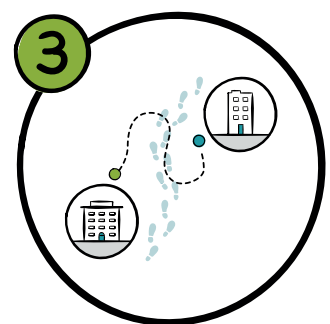
So, what constitutes your campus? These strategic questions help to synchronize teams and shine light on your specific scenario – whether it be a metro or rural site, traditional university or otherwise.
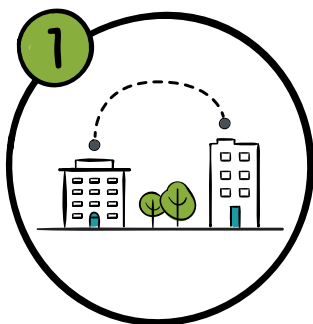
Is it a single, contiguous piece of land with two or more logically connected buildings?
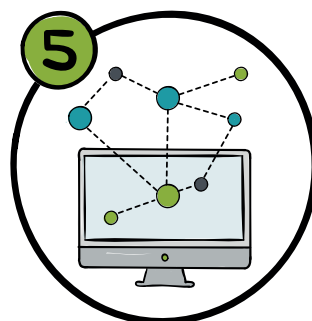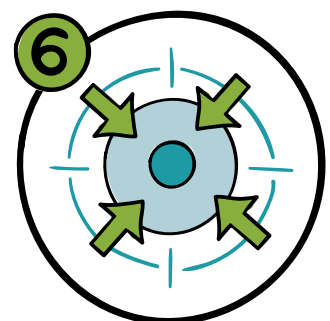
Do all buildings leverage a set of shared services?

Are there branch and satellite sites that do not form part of a physical campus yet do form part of a logical campus service footprint?

Is it a single governance domain or topology based upon proximity?

Do digital services map cleanly and clearly to well-known physical boundaries?

Are there future builds, financial constraints, acquisitions, or roadmaps that warrant a more distributed or centralized pattern?

People and
Primary Activities

A campus technology footprint caters to multiple groups – students, visitors, employees, academics, executives, support staff or third parties.

Each group may have different needs or perform their daily tasks in different ways. So, generate personas, capture use cases and model potential risks to elicit requirements quickly and efficiently.

It is also critical to understand the schedules and timing of activities performed on campus including any dependencies on network or network attached services. Eliciting edge cases early on is extremely important, as is not forgetting often overlooked smaller teams.
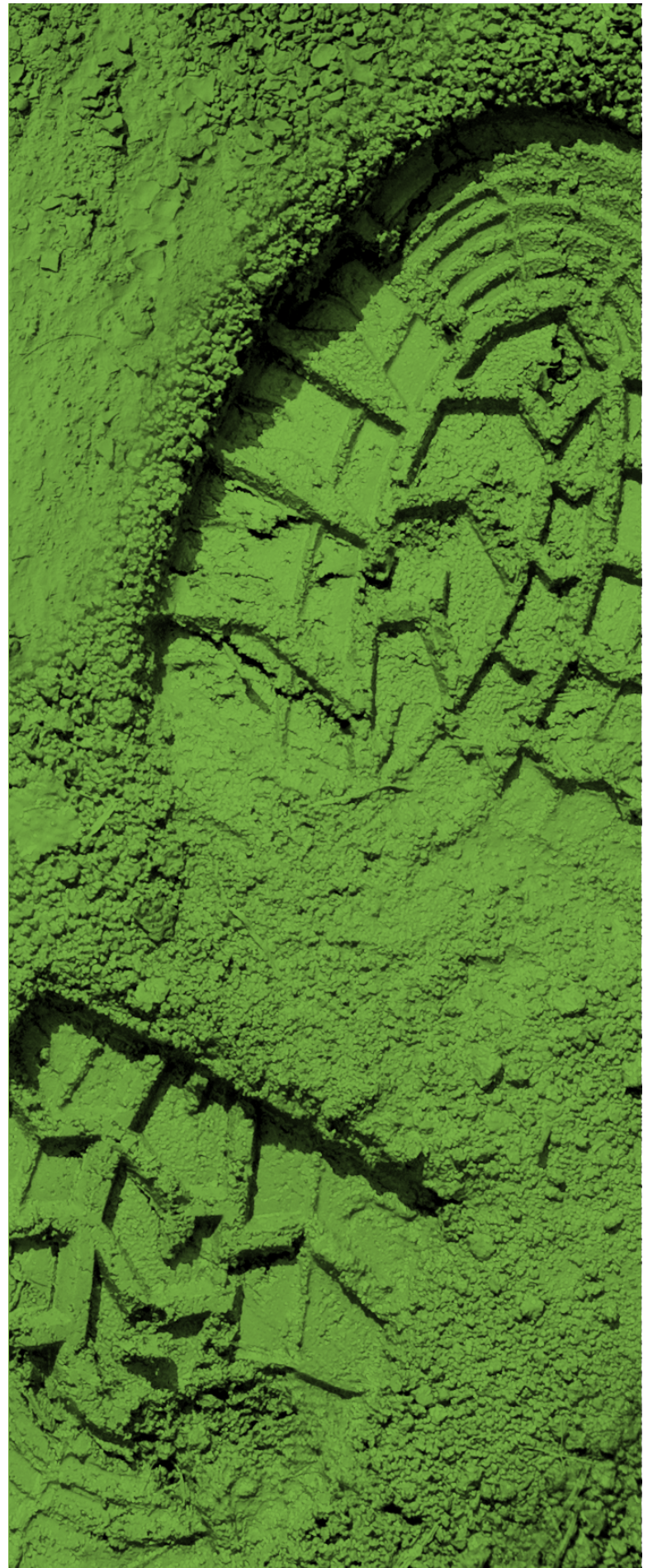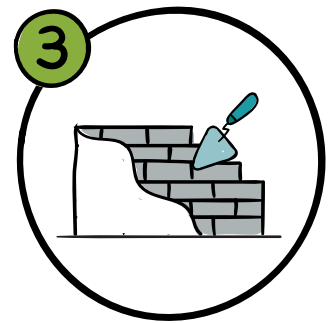
Buildings and Their Roles

Not all buildings are created equally. Each may have mixed use cases. Considerations here include:
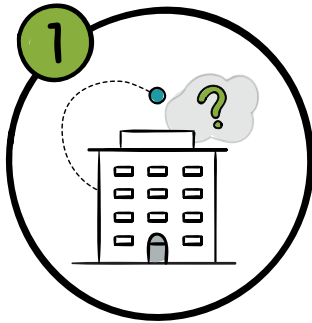
1. What role does each building play and what does it house?

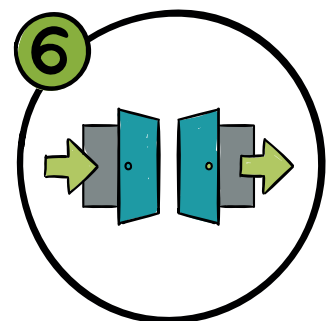2. Are there any broad categories or zones applicable to each designation?

3. What materials are used in each building's structure?

4. How do users consume services as they move throughout or between buildings?

5. What spaces are expected to provide standard or enhanced digital services?

6. Where do utilities enter and exit buildings and what ducting or conduits are preexisting?

Dependent upon whether a campus is newly built or is a connection of existing buildings, questions arise regarding where best (and most cost effectively) to provide shared services from.

Also consider the level of resiliency and internal or external connectivity required. By embracing modularity and architecting for categories of active or passive buildings, total cost of ownership can be optimized accordingly.

Fixed and Mobile Devices

Although the current focus tends to be on user mobility and associated devices, there's a broad range of endpoints typically serving campus needs. These endpoints for consideration include:

Security cameras

Access control mechanisms

Printers

Servers

Teleconferencing (or other audio visual) units

Building Management Control Systems

Other larger Industrial Control Systems

Specialized lab equipment

IoT (Internet of Things) inc. sensors etc.

They all require differing forms of network connectivity, management, and data security. Whether there's on-site data centers, small distributed server rooms, or just standard switching closets, there is an increasing number and type of managed (or unmanaged devices) interconnecting across campus fabrics.

Introducing the concepts of trust, temporality, and mobility early on can be helpful for classifying devices and their security controls. Even with a so-called 'smart campus', there's still a need to enforce policy, define network boundaries and apply suitable security zoning.

Digital Services and Flows

When viewing the campus as a fabric for humans and machines, there are multiple flows and services that each entity creates, engages with or has dependencies on. Understanding these digital flows as they cross the fabric allows for useful models that help with network planning and design.

Whether zoomed in to a single building or viewing the entire campus, enumerating north-south and east-west traffic helps to identify a project's scope and scale.

Highlight early on any external services or interconnections to service providers, research networks or third parties. This leads to a better understanding in relation to traffic patterns, where to place policy enforcement points, and potential capacity related bottlenecks.

Shared Network Services

Each network topology has its own control plane requirements but there are standard network services expected by almost every user and device. Irrespective of who administers such services as DNS, DHCP, and IAM, their reachability, integrity and positioning are paramount in a campus fabric.

Any on-premises compute or data center environment also provides (or consumes) a range of services to local populations (and increasingly to remote entities too). Additional consideration should be given to whether services like multicast or anycast feature in either service discovery or delivery.

Checklist:
Defining Your Campus
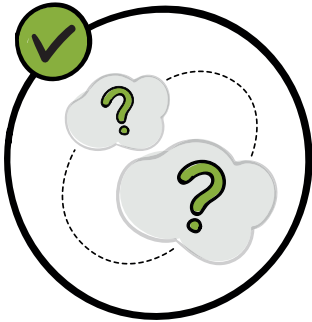
Consider the questions that help you define what constitutes your campus.

Generate personas of daily campus users, capture use cases and model potential risks.

Model the schedules and timing of activities performed on campus including any dependencies on network or network attached services.
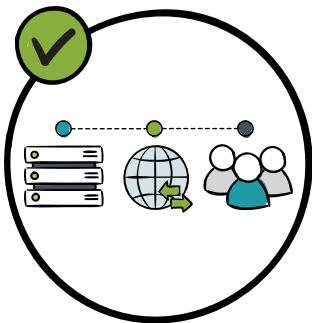
Consider the buildings within the campus and their respective roles.
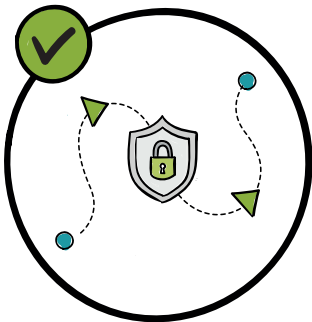
Define the fixed and mobile endpoints, not only in terms of type but security classification and controls.

Develop a sense of project scope and scale by establishing the scope and scale of north-south and east-west traffic.

Better understand traffic patterns by highlighting any external services or interconnections to service providers, research networks or third parties.
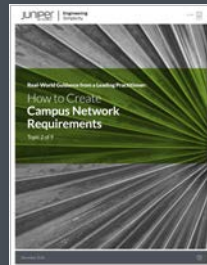
Define the reachability, integrity and positioning of network services such as DNS, DHCP and IAM.

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Topic 2: How to Create Campus Network Requirements

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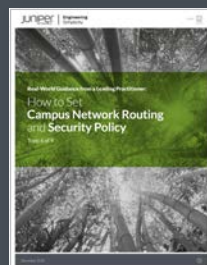**Topic 3:** How to Define a Simple Campus Network Security Model

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